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THE CLAPP-GRIFFITHS STEEL PROCESS.

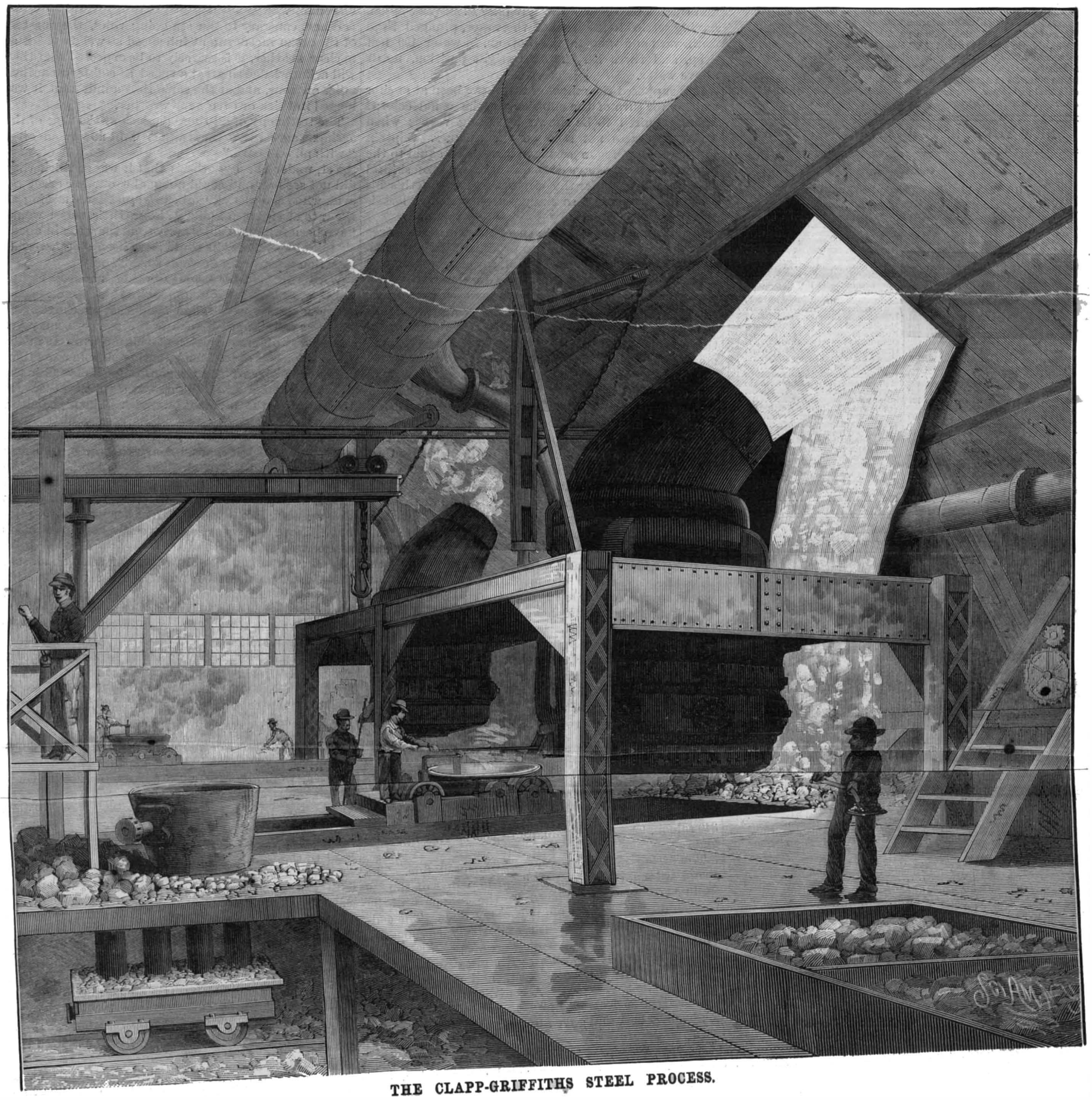
The metallurgy of iron has for several decades past attracted the closest attention of the chemists of both Europe and America. It has become, beyond question, the chief industry of the century, and therefore worthy of their best study. Each of the numerous departments of iron working has claimed its special investigators. In the reduction of the ores to the crude pig metal, the improvements have been marvelous. The clumsy stone furnaces of twenty and thirty years ago, with their weekly product of forty to a hundred tons, have given place to the graceful shafts of iron and firebrick, which now produce as much as three hundred and twenty-five tons of pig metal in twenty-four hours. In the subsequent transformations which the crude metal undergoes, the changes have been no less remarkable. The introduction of the Bessemer process in this country, and the revolution effected by the cheap steel thus made possible, are within the memory of many of our readers.

This metallurgical activity has brought the introduction of so many improvements and modifications that, perfect as the art of the iron worker has now become, new changes must be expected at every turn. It is our present purpose to illustrate one of these improvements —the process of Messrs. Clapp & Griffiths—as it has now passed from the experimental to the practical stage, and its rapid introduction among American iron works indicates that it is destined to become an important factor in the metallurgy of coming years.

But it will, perhaps, be advisable to first point out the condition of the industry at the time of the introduction of this new process, and glance at the field which it is probably to occupy.

At present a strong tendency exists to substitute steel for wrought iron wherever possible. The change is not the result of any demand on the part of consumers, nor in many cases is it due to any superiority of steel over iron. The cause is even more potent. It is simply because it is easier and cheaper to make steel than iron, and this being the case, the substitution must inevitably follow. Yet this tendency has certain limitations. Crucible and open-hearth steel are still too expensive to be used for aught save the better grade of goods, while the Bessemer product is restricted by the quality of the crude materials it requires and the heavy expense of erecting and operating such a plant. For years the puddling furnace has been used to produce iron, but it has done so at a heavy cost and with a labor the severity of which in time becomes fatal.

(*Continued on page* 196.)



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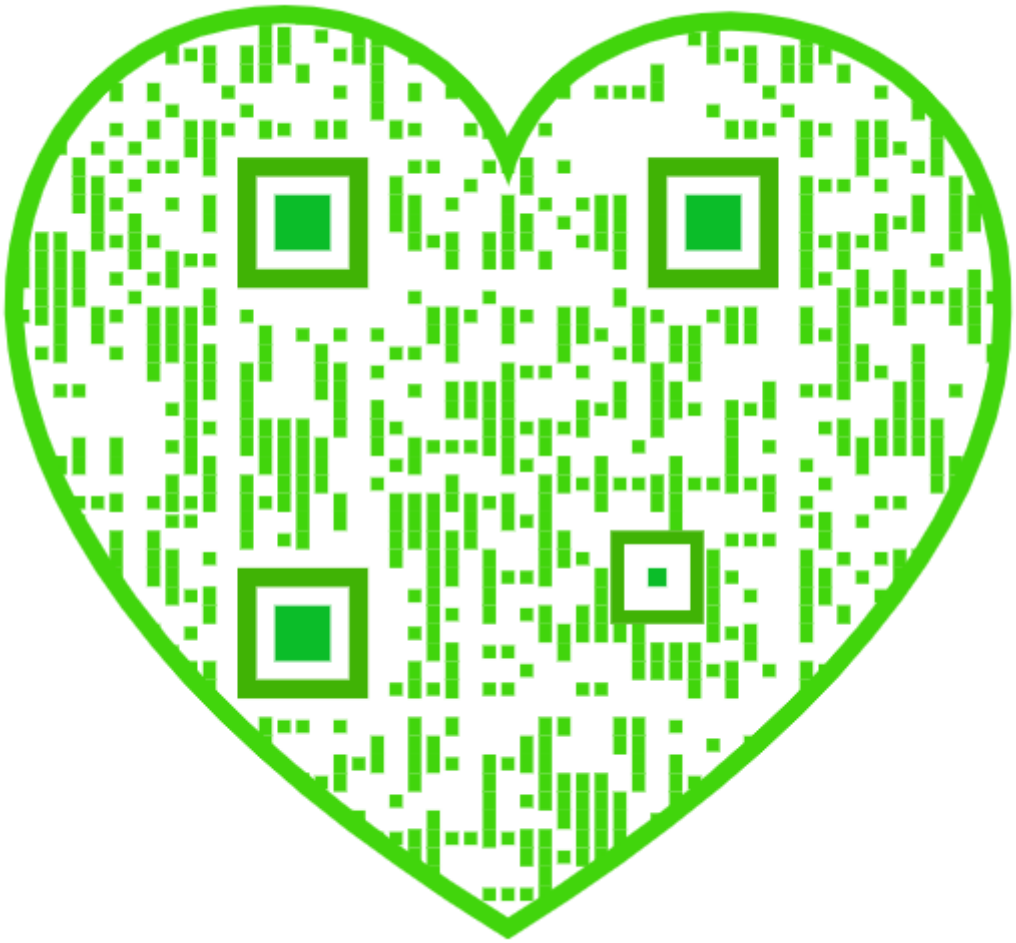

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NEW YORK, SATURDAY, MARCH 27, 1886.

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LOSS OF THE CUNARD STEAMER OREGON.

On Sunday, March 14th, at 4:30 A. M., the splendid steamer Oregon, from Liverpool bound to New York, when off the Long Island coast, collided with an unknown sailing craft, and both vessels were lost. The sailer is supposed to have instantly sunk with all on board. The Oregon floated for 8 hours, and then went down in 120 ft. water. All on board were saved. The accident took place about 10 miles out from the shore and about 50 miles east of the entrance to New York harbor. The wind was light, sea calm; it was dark, but clear enough to see lights on shore.

The steamer was running at full speed, over 20 miles per hour. The lookout shouted as he saw the approaching sailing vessel, a white light was seen, the wheel was turned hard-a-port; instantly the two ships collided, the supposed schooner swept by, and was seen no more. The Oregon's engines were worked for half an hour, when the fires were extinguished by rise of water to the furnaces. It was found she was making water rapidly. By the collision a large hole, stated by the captain to be 18 feet square, was made on and above the water line, and another hole, 4 × 6 feet, was made below the water line. The great ship soon began to settle. Signals were given—guns and rockets; orderly preparations made to occupy the ten lifeboats. All were supplied with life preservers. By 10 A. M. two small sailing vessels had come to the rescue, and to these, by means of the boats, the passengers and crew, 896 souls in all, were safely transferred. The crew numbered 205. Soon another large steamer, the Fulda, came up, and the people were taken on board and carried into New York. At 12:30 P. M. the Oregon, having settled to the level of the water, plunged head downward and went to the bottom, in water 120 feet deep, and there lies, in an upright position, masts above water.

It is supposed the schooner may have been at anchor waiting for turn of the ebb tide, as the usual colored lights, required to be shown by sailing vessels when under way, were not seen on the steamer. Captain Cottier of the Oregon seems to have been equal to the emergency, and to have done all that a cool and skillful officer could do under the circumstances. Of this his successful transfer of so many persons without loss is evidence.

Probably no finer specimen of marine architecture than the Oregon has yet been produced. She was unsurpassed in strength and speed, supplied with many requisites for safety, but lacking in flotation power and in devices suited for the temporary stoppage of leaks. She had no special means for preventing access of water to the furnaces. One of the firemen states that the passageways between three of her compartments were open at the time of the accident, and could not be closed; another statement is that the force of the collision was so great as to break one of the compartment partitions, thus knocking two compartments practically into one.

The loss of the Oregon emphasizes the need, many times heretofore by us expressed, of further inventions and study in the line of safety appliances for sea-going vessels. Honor and emolument await the man who can show how to keep a merchant ship afloat, without greatly increasing the cost. It is easy enough to make unsinkable vessels if the exchequer or building fund is large enough. Double ships, with many air chambers, can be made, which will certainly keep the ship afloat. But for commercial purposes such boats would not pay, owing to enormous cost; and it is doubtful whether they could have speed enough, owing to their increased weight.

Let inventors ponder the subject, and if possible contrive some new way of arranging materials so as to evolve a new style of unsinkable vessel. The compartment system is of great value, but is not wholly sufficient. To say the least, it can be much improved.

The steamship Oregon was built by John Elder & Co., at Glasgow, and was launched on June 21, 1883. Her dimensions were: 520 feet in length, 54 feet breadth of beam, 40¾ feet depth of hold, and 7,250 tons [illegible] bulkheads, five iron decks, and a strong turtle-back deck forward and aft as a protection from the heavy seas. She was fitted to accommodate 340 saloon, 92 second-cabin, and 1,000 steerage passengers.

The fittings of the Oregon were unusually fine. The grand saloon, capable of dining the whole of the 340 cabin passengers, was placed in the fore part of the vessel, and was laid with a parquetry floor. The ceiling decorations were almost exclusively confined to white and gold. The panels were of polished satinwood, the pilasters of walnut, with gilt capitals. The saloon measured 65 by 54 feet, and was 9 feet in height in the lowest part. A central cupola of handsome design, 25 feet long and 15 feet wide, rose to a height of 20 feet, and gave abundant light and ventilation.

Her engines were of 13,000 horse power, screw 24 feet diameter, 9 boilers, 54 furnaces; coal consumption, 300 tons per diem. Some of her passages are among the shortest ever made, namely, Queenstown to New York, 6 d. 9 h. and 42 m.

Some of the difficulties in the way of safety in such a ship as the Oregon may be conceived if we consider what takes place, mechanically, during an ocean voyage. The exertion of 13,000 horse power is equal to 191,517 tons lifted a foot high every minute. Her screw pushes the ship ahead with a power equal to that of twenty of the most powerful locomotives; 300 tons of coal a day must be brought to the fires, and the ashes removed; 2,500 tons of fuel must be stored and handled. The confined area of the vessel seems to forbid the employment of anything except manual labor in the work.

AS TO THE SINKING OF THE OREGON.

The bare fact that the Cunarder Oregon received the injury which caused her loss from collision with a sailing vessel seems to be pretty well sustained. Beyond that, the testimony is confused and conflicting, and the reticence of the ship's officers, especially upon several important points, lends an air of mystery to the affair which certain admissions of the crew serve to intensify. On the one hand, we are told that it was a clear, starlit night when the collision took place, and, on the other, that it was hazy. Remembering that neither the first officer, who was on the bridge, nor the watch on deck, including the lookout forward in the ship's eyes, could be certain as to whether the strange sail was a sloop, schooner, tern, or square-rigger, whether she was close-hauled or running free, the supposition that the weather was hazy seems not unreasonable.

When, contrary to the sea-going rules, the masters of the ocean racers run at full speed as well in thick as in clear weather, it is scarcely to be expected that they will acknowledge so great a speed as eighteen nautical miles an hour, and at the same time admit that it was logged in thick or even hazy weather.

The testimony of all those on deck at the time of the accident agrees that the stranger went down soon after "with all on board."

Yet, under the hypothesis that it was so thick they did not see her, and could not make out her exact rig even when she was close aboard, and that, running at the rate of eighteen knots an hour, their vessel would have been fully two miles away from the scene in about six minutes—before she could have been stopped—this assertion must be set down as surmise only.

With the conditions prevailing of smooth sea and light wind, it is not impossible that some of the stranger's crew were taken from the wreckage by a passing vessel, and, if such is the case, we may yet hear a very different version of this unfortunate affair.

A curious bit of testimony, gathered from more than one person aboard the Oregon, is to be found in the assertion that a *white* light was seen ahead several times before the accident occurred. The first officer, who was on the bridge and in command, says he took it to be the light in the rigging of a pilot boat, or a torch, which it is customary to burn on the deck of such craft when a steamer is sighted. But the pilot boat on that station having now been heard from, we know with something like certainty that the vessel which caused the disaster was not a pilot boat. Now, no other sailing vessels save pilot boats are permitted under the law to show a white light when under weigh. The law says that, when under sail, these craft must show a green light in the starboard fore shrouds and a red one in the port shrouds. Therefore, when a sailing vessel shows a white light, it indicates her to be either a pilot boat cruising for ships or a merchantman *at anchor*. We are told that the wind was west by north and light, and a glance at the tide tables shows us that, at the time of the collision, the tide was running on the first quarter of the ebb, that is to say, it was running to the eastward. Under these conditions of head wind and tide and smooth sea, the most natural thing for a sailing vessel bound for the port of New York to do, as those will agree who, like the writer, have followed the sea, would be to come to an anchor. She could [illegible] and do anything with the wind light and dead ahead, and to have stood down to the southward would have been only throwing away her chances of a fair wind later on, remembering that at this season a westerly wind is more likely to veer to the north than haul to the southward.

Supposing, then, that the strange sail was at anchor, with the wind west by north and an ebb tide; she would have been tailing the direction from which the Oregon was advancing, and thus the statement made by one of the Oregon's passengers that he saw her stern seems not improbable. Again, if the stranger was really in this position, it would readily account for the flashing white light which the first officer and others say they saw, because, as she swung to her anchor, the masts and after shrouds of the stranger would at times have been in range with and temporarily obscured the white light in her forestays.

While this is, of course, mere supposition, and offered only as suggestion, it may safely be said that the generally accepted theory, based upon the testimony of

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the Oregon's officers, that the strange sail was standing inshore on the port tack, with the wind over her port quarter, is untenable. For, if she were bound east, the west by north wind would have been dead astern for her; the most natural position for her sails, wing and wing; and her course exactly parallel with that made by the Oregon, though in the contrary direction. To say that a sailing vessel bound east, with the wind dead aft, was on the port tack, and heading N.N.E., would imply that her skipper had lost his senses.

If, on the other hand, the stranger was bound into New York, but instead of being at anchor, as suggested above, was really beating down the coast against wind and tide, she would seem, according to the position of the injury to the Oregon, to have been close-hauled on the starboard tack. She could not pay off her course without running into the steamer. All that was left her was to come up into the wind and go about on the other tack. Having the right of way, and time being short, she did neither, and the steamer, when too late, ported her helm to avoid running over her, and as a result struck her a glancing blow.

PRACTICAL DIRECTIONS FOR LIGHTNING RODS.

As the season of thunder storms is not far distant, a few practical directions for lightning rods may be found useful.

Quarter inch naked copper wire, such as is used for street electric lights, will do for the rods. Two of such rods are better than one, each rod to be continuous, or if jointed, the joints to be soldered.

Run the upper end of rod around the edges of the chimney, and thepeaks and edges of the roof; bend so as to leave a looped point at each corner; points to be 6 inches high. Fasten the rod directly to the exterior of building with staples, no insulators. The bottom of each rod should be wound around the metallic street water pipe (or gas pipe, if there is no water pipe). Better solder the rod to the pipe.

By means of branch wires or rods connect the lower ends of the water leaders, also one end of each metallic gutter, also all metals and metallic roofing, if any, with the rod; solder the connections, and run rod to ground and around the water pipe, as before stated. Several separate rods may be used. The more the better, if properly grounded.

The essential rule of safety is to have the rods well connected with the earth. For this reason soldering to the underground water pipe is advised.

If no metallic water pipes or gas pipes exist, then dig a very narrow trench four feet deep, cone-shaped bottom, and fill into bottom a continuous layer of coal dust and lay the rod therein. Any kind of coal dust, charcoal, hard or soft coal will do. The trench with coal dust layer and rod therein should be say 100 feet long. Coal is an electrical conductor. The object of placing the lower end of the rod therein and extending the rod so far is to secure good ground conduction and connection for the rod.

The great majority of rods now erected are deficient in their ground connections, and consequently are practically useless. This is the reason we hear of so many instances of damage, even when buildings have rods. In general, the rod is simply stuck down two or three feet deep into dry earth, which is about the same as if the lower end of the rod were inclosed in a bottle; such rods are fatally defective. Now is the time to look to your rods. Correct the main defect, by making a first rate ground connection, as above described, or take down your rod. The only chance for safety is with a good ground connection. The risk of damage is less without a rod than with one badly connected to the earth.

WATERPROOF WRITING INK AND PAPER.

An incident connected with the loss of the steamer Oregon and her cargo calls attention to some much needed inventions.

A portion of her mail was saved before she sank, but the bulk went down with the ship. A considerable portion of this mail is reported to be of great value, containing securities, coupons, etc., amounting, as has been estimated, to over a half a million of dollars, besides drafts, letters of credit, etc., the value of which is unknown.

A wrecking company employed to inspect the wreck, and report upon the possibility of recovering the ship and the cargo, reported that the cargo and mail might probably be got out of the steamer, and the reconnoitering steamer also picked up some floating mail bags and brought them to New York, where their contents were dried previous to forwarding them to their ultimate destination. Much of this mail matter was, of course, badly damaged by wetting, and more serious injury is to be expected in that which, at the bottom of the sea, must be subjected to long soaking prior to its recovery, if ever recovered.

Now, to secure a mail, as far as possible, from injury by submergence in salt or fresh bodies of water there must be waterproof mail bags, waterproof paper, and waterproof ink.

Waterproof mail bags will not alone be sufficient, as in the process of handling or raising them from a wrecked vessel they are liable to be rendered leaky, and waterproof paper would be of no service unless it was accompanied by waterproof ink.

The mail bags need only be waterproof in the common acceptation of the term, and, if there could be certainty that they would remain so, nothing more would be needed to protect documents or anything else permitted in mail bags; but as holes are likely to be worn or torn in them, the only final resource is in the production of paper and ink that will resist the prolonged action of sea water.

There can be no doubt, we think, that if paper and ink which will meet this requirement can be furnished at reasonable cost, they would at once find a ready market throughout the civilized world, provided certain other requirements are at the same time complied with.

Waterproof paper and waterproof ink already exist. What is known as parchment paper will withstand the action of sea water indefinitely, and this can, of course, be written upon by certain carbon inks in market containing materials that, once dried, are thereafter practically insoluble. But that these do not meet the wants of the public for writing materials is proved by the fact that they are not universally employed for transatlantic correspondence. The materials required must not only resist the action of sea water, that is to say, the sodium chloride, iodine, and bromine held in solution, but they must be nearly or quite as convenient to use as ordinary paper and ink.

The paper should be light, flexible, and opaque, to economize postage; fold easily, and prevent writing from showing through. As for economy in foreign mails, it is essential that paper should permit writing upon and copying from both sides.

The problem is both mechanical and chemical in its nature, and the resources of modern chemistry and mechanics should be, we have no doubt are, equal to its solution. Any seeming incompatibility in the requirements named will probably vanish in a careful study of these resources.

The Gaskill Engine.

A new Gaskill pumping engine was added some months ago to the waterworks at Buffalo, N. Y. It has since been subjected to a three months' test, prior to its formal acceptance by the water commissioners. This probationary period ended on the first of March. The performance of the engine during these months has been very gratifying. It indicates a marked fuel economy, exceeding the guaranteed duty by about 11 per cent. Though now idle, awaiting the extension of the street mains, it will probably eventually be utilized for direct pumping, according to the Holly system, a portion of the city being at present but imperfectly supplied by the reservoirs.

Railway Practice in Italy.

Mr. S. Fadda, the Chief of the Department for Preliminary Studies of Rolling Stock in Upper Italy, contributes an interesting paper to the Transactions of the British Institution of Civil Engineers, descriptive of the methods of construction and operation of locomotive engines in that department. (Paper No. 2,081.)

The first line was built in that country in 1838, between Naples and Portici. In 1859 railways were opened in Parma and the Papal States. There are to-day 320 miles (15,000 kilometers) of road built, under construction, or authorized, about two-thirds of which are in operation. The engines are usually of English construction. Some of the more recent locomotives are from French, German, and Austrian establishments. Many of the gradients are very heavy, necessitating heavy engines.

The shells of the boilers, curiously enough, are of iron, the law forbidding the use of steel or of "homogeneous iron." The fireboxes are of copper, though steel has been tried unsuccessfully. The tubes are of drawn brass—70 copper, 30 zinc. They must bear a test pressure of 25 atmospheres, receive the ferrule without cracking, bear bending to a curve of 20 in. length and reversed sine of 2½ in. without injury, and must be uniform and true to gauge. Iron tubes in adjacent parts of Europe have been given up and replaced by brass. All wheels, as well as axles, are of wrought iron. The tires are of crucible steel or of Bessemer or Siemens tin metal. The frames are wrought iron, the cylinders of cast iron, the slide valves of gun metal, often, the rods of crucible steel. During late years, the number of engines placed on the principal lines has exceeded those so added in England.

The carriages are usually of the English type, but sometimes of the American form. An intermediate or composite type has of late been adopted, as suggested by the late Heusinger von Waldegg, in which a passage is provided at one side the line of compartments, along which the guards can traverse the carriage and the train from end to end, the communication between carriages being effected by the use of platforms at the ends, as in American cars. This removes one of the great dangers and inconveniences attendant upon the use of the English style of carriage, and gives both the safety and convenience of communication of the American design and the privacy in each compartment enjoyed in the Continental system. In case of trouble, it becomes easy to notify the guard, and to secure his presence and aid.

Italy is still far behind the other countries of Europe, generally, in all that relates to the useful arts, and the introduction and maintenance of manufactures seem to find but little encouragement or success. The writer of this paper hopes to see a change in this respect in the future, but evidently finds no great evidence of progress at present.

PHOTOGRAPHIC NOTES.

A Soda and Ammonia Developer.—Mr. W. Jerome Harrison in a recent number of the *Photographic News* speaks of using the following developer with considerable success in the development of lantern slides and negatives. He uses the pyrogallic acid in solution with citric acid and sulphite of soda, termed sulpho-pyrogallol, essentially a 10 per cent solution of pyro. He says: I have made many slides with this soda ammonia developer, and without a single failure; while the wonderfully steady and uniform manner in which the image is built up allows full density to be obtained and development to be stopped at exactly the right time. The small quantity of ammonia appears to act as a "whip," starting development, and the soda then carries on and completes the work.

With the use of sulpho-pyrogallol the development may be prolonged without staining the film.

The normal developer is:

Water	1 ounce.
Pyro	2 grains.
N. H. 4 Br	1 grain.
Carbonate of soda (washing soda)	100 grains.
Ammonia	1 minim.

The ammonia used is in the form of a 10 per cent solution.

Use of the Polariscope in Photographic Lenses.—In the *Br. Jour. of Photo.* Mr. J. Vincent Elsden speaks of the advantage which the polariscope has, when inserted between the lenses, of preventing the injurious effect on a plate of the strong reflection and glare which sometimes occurs when the lens points toward a window or a large body of water.

He took a small Nicol's prism from a microscope, out of its brass mounting ring, and fitted it into a cork rim; he then inserted it between the two lenses of a rapid symmetrical, so as to occupy the position usually taken by the diaphragm.

Owing to the small size of the prism, it acts as the diaphragm itself.

The exposure in comparison with the use of the smallest stop had to be twice as long.

By the use of the prism he was able to obtain a little more detail in certain parts of the picture, where there had been a strong reflection. Photographers have often to deal with awkward cases of reflection from shining surfaces, such as tombstones, oil paintings in a room, sheets of water, and similar things, and the ease with which a polariscope can be fitted to a lens suggests the advisability of at least trying its effect in diminishing the glare, especially as but little harm can result, except an increase in the length of the exposure.

Scranton Bessemer Steel Work.

The Scranton Steel Company, of Scranton, Pa., reports the following figures as the result of its December work:

Number of 12 hour turns worked	25
Number of heats made	1631
Total tonnage (gross)	7220
Average tonnage per turn (gross)	288·80
Average number of heats per turn	65·24
Average tonnage per heat (gross)	4·43

The number of heats per turn, 65·24, is very remarkable, and is due to the small size and convenient arrangement of the vessel plant.

Freight Cars Drawn by Electricity.

Mr. John C. Henry, of the Henry Electric Railway Company, Kansas City, Mo., writes us as follows:

"On January 29 I hitched our electric car Pacinotti to a K. C. F. S. & G. coal car, weighing 17,500 pounds, and took it up a 2½ per cent grade. Yesterday I coupled the same motor car to C., B. & Q. box car 19,178, weight 24,500 pounds, and started it without jerking, on a 3 per cent grade. I claim the distinction of being the first to haul regular standard gauge freight cars by electricity, and would be pleased to have you record it."

Zinc.

L. L'Hote in *Comptes Rendus* says: As to the inquiry if zinc free from any foreign metals decomposes water either on boiling or in presence of dilute sulphuric acid, experiment proves that such is not the case. Pure zinc heated with distilled water in a flask, so arranged as to receive the gases over mercury, gives off no hydrogen on prolonged boiling, nor is it attacked by dilute sulphuric acid. The presence of iron in proportions of from 3 to 5 in 100,000 enables it to decompose water. Traces of arsenic and antimony have the same effect.

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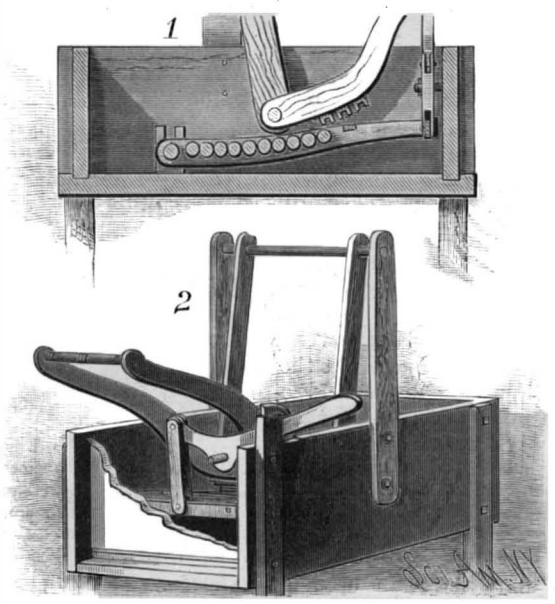
WASHING MACHINE.

The side bars of the rubber are mounted on a shaft uniting the lower ends of two arms projecting from a shaft held in the upper ends of two standards secured to the sides of the tub; the side bars of the rubber are united by grooved rubber bars, as shown in Fig. 1. The bottom rubber consists of a frame pivoted in blocks on the inner sides of the tub at the bottom, to adapt the free end of the rubber to be raised or lowered. Journaled in this frame are rollers. The frame is moved by an elbow lever, over the handle of which a hook on one side of the box can be passed. The clothes to be washed are placed between the rubbers, the upper one being rocked to



DIXON'S WASHING MACHINE.

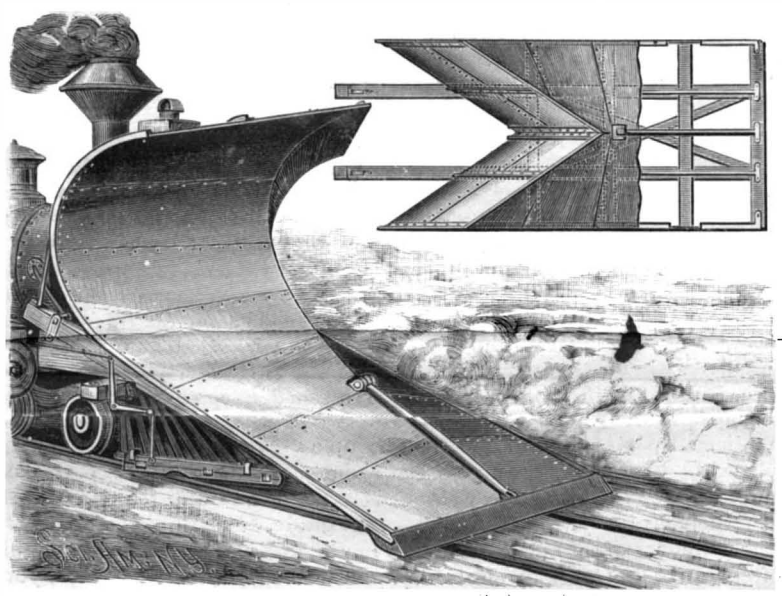
and fro and at the same time pressed upon the clothes. The lower rubber can be adjusted according to the quantity of clothes to be washed.

This invention has been patented by Mr. Ellis W. Dixon, of Yakima, Washington Territory.

IMPROVED SNOW PLOW.

The accompanying engraving represents a snow plow for which letters patent have been granted to Mr. John M. Poitras, of Deseronto, Ontario, Canada. One of the main objects of the inventor was to provide a plow light enough to be carried upon the forward part of the locomotive, and which would always be in readiness to clear the track of any depth of snow that could be removed by any snow plow propelled by one or more locomotives.

The general form of the plow is very clearly shown in the engraving, the upper cut being a plan view. The face or share of the plow is formed of sheet metal attached to a substantial frame, the upper end of which is firmly secured to the locomotive. The shoe of the plow is made of steel and is secured to the under side of an oak nose piece; the under side of the shoe is curved to fit the nose piece, and on its front is a sharp flange projecting toward the rear and overlapping the



POITRAS' IMPROVED SNOW PLOW.

sheet metal covering. The construction allows the front part of the plow to be sprung down upon the rails under a great pressure, but it is usually held about 1¼ inches above the rails. The side edges of the plow are strengthened by angle irons. Flanges held on the bottom edge of the cow catcher can be lowered to thoroughly sweep the remaining snow from the track. When there is but little snow on the track, the nose of the plow swings clear of the rails; but when the snow is of sufficient depth, the shoe is forced down upon the rails, and the snow is all guided up the inclined faces of the plow and thrown to the sides.

Manufacture of Hydrogen Gas.

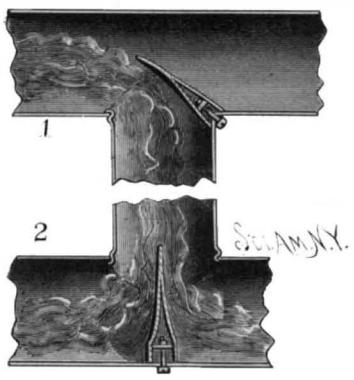
A new method for producing hydrogen gas is described by MM. Hembert and Henry. Superheated steam is passed through red hot coke in a retort. The result is a mixture of hydrogen and carbonic oxide—or what is known as water gas. These gases are then passed on into a second retort, strongly heated, in which a quantity of some refractory substance, such as firebrick, is placed. At the same time, jets of steam superheated to the point of dissociation are passed into the retort, the result being a mixture of carbon dioxide and a double amount of hydrogen. The carbon dioxide can be absorbed by passing through milk of lime, and thus pure hydrogen be obtained and collected in a gas holder. One ton of coke is stated to correspond to 3,200 cubic meters of gas, and the cost is given as 0·015 franc per cubic meter.

Three Chimneys.

Three tall chimneys belonging to Kunheim & Co., of Berlin, were lately destroyed by means of gun cotton. The largest was about 147 feet high, and 10 feet diameter at the base. In order that it should fall outward from the city, the charge of gun cotton (about 57 lb.) was attached in portions to the side next the city and to the adjacent sides. All three were exploded simultaneously with a magneto-electric apparatus. The chimney, instead of falling obliquely, collapsed vertically, and on inspection the four walls of the pedestal were found to have been driven outward. The bricks were all detached from each other, and nearly all entire. The debris was thrown a very little distance. The two other chimneys, treated similarly, fell as was expected, *i. e.*, obliquely away from the city. One of them, in falling, broke in two about the middle.

SMOKE CONDUCTOR.

The object of this invention, which has been patented by Mr. Thomas Rundle, Jr., of Iron Mountain,

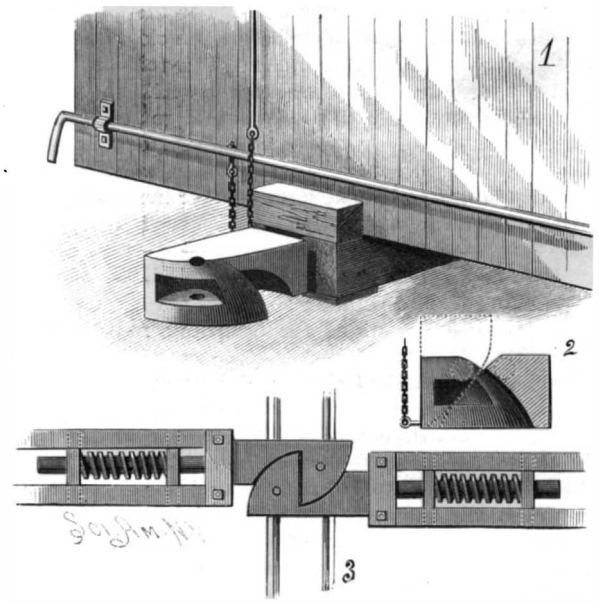


RUNDLE'S SMOKE CONDUCTOR.

Mich., is to provide an attachment for the T-couplings of smoke or hot air pipes, whereby the different currents will be properly mixed and one cannot interfere with the other. The bottom edge of the circular plates is made semicircular to fit the inside of the pipe (Fig. 2), or on the corner in an elbow whose two pipes are united at right angles (Fig. 1). A recess in the plate increases from the middle toward the lower edge, and is provided with a cross piece having a hole, through which a bolt can be passed. By drawing the bolt up tight the edge of the plate is pressed firmly against the pipe or corner. In each case the plate acts as a deflecter, guiding the smoke in the proper direction. This device is of special advantage where the smoke from one stove is conducted into the pipe of another—for instance, when two stoves are at different distances from the chimney, and only one pipe is to be used to lead the smoke from both stoves to the chimney.

CAR COUPLING.

The car coupling herewith illustrated is automatic in its action of coupling, and is simply rotated in order to uncouple the cars to which it is attached. The drawhead and hook are formed in one piece, and are secured to the car in the usual way by means of a drawbolt, as shown in Fig. 3, which is an under side view. The forward, inner, and upper edges of the drawhook are rounded off, and the bearing face of each is at right angles to the length of the drawhead; the side point of the hook projects out beyond the side of the drawhead. Back of the face the drawhead is concavely recessed to fit the convex face of the hook. Upon the outer flat side of the drawhead is an eye, to which chains are fastened; one chain leads to a transverse rod having a crank at each end, and the other leads to a rod (Fig. 1) extending a little above the roof of the car. These chains support the drawhead and hook in the position shown in Fig. 1; for as the drawbolt projects from the upper central corner of the rear face of the head, the bulk of the weight of the head and hook is below the bolt, and if it were not for the chains, the head would drop down to a point directly below the drawbolt. When the cars come together, the convex faces of the couplings strike upon each other, and the drawheads are turned until the right angle faces are in line, when the force of gravity will return the parts to the position shown in Fig. 3, the points of the hooks entering the recesses. To uncouple the cars, one of the drawheads is turned by the chains



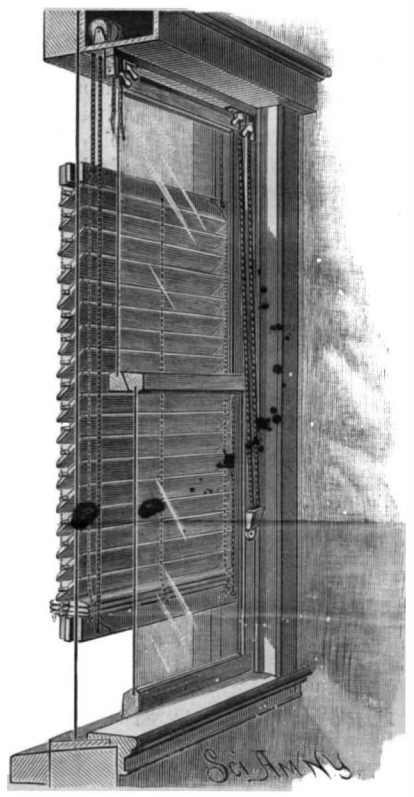
HARRINGTON'S CAR COUPLING.

to the position indicated by the dotted lines in Fig. 2, when the hooks will clear and the cars may be moved apart; or both couplings can be moved one-half the distance. Each drawhead is formed with a recess to receive the ordinary link when its use is necessary.

This invention has been patented by Mr. John H. Harrington, of New Bedford, Mass.

AN IMPROVED "VENETIAN" BLIND.

The illustration herewith represents a form of window blind composed of movable slats, so constructed that the blind will be easy of adjustment, and can be readily held at the top, bottom, or middle part of the window as desired. The top and bottom bars of the blind have tongues sliding in vertical grooves in the uprights of the window frame, while the slats have end pivots passed into the grooves, and are connected at the front and back edges by chains secured to the top and bottom bars, which hold the slats



HAWLEY'S WINDOW BLIND.

at the desired inclination and allow them to lie snugly on each other. The top and bottom bars have corner pieces, to which are secured chains for raising or lowering them, a chain being provided for each side of the window, which passes over pulleys in the top plate, the free end resting in boxes on the window frame, the slack being thus taken up, and the blind being secured in any desired position by small clamping levers at the upper corners of the frame.

This invention has been patented by Mr. Henry Hawley, of Culpeper, Va. For further particulars address Messrs. Latham & Hawley, of that place.

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A MECHANICAL COUNTER.

It is apparently a very simple matter to construct a counter, but experience shows that these apparatus are often the cause of a good deal of annoyance. Either the wheels indicating the high numbers stick on their axes by reason of their infrequent movement, or the stroke of the lever is too short and the pawl fails to engage with the ratchet, or the stroke is too long and the lever is bent, or some other trifling accident often intervenes to upset a test which has been conducted with care and at great expense. All these sources of difficulty appear to be avoided in Kaiser's counter, which we illustrate.

In it the axis of all the wheels is moved at each

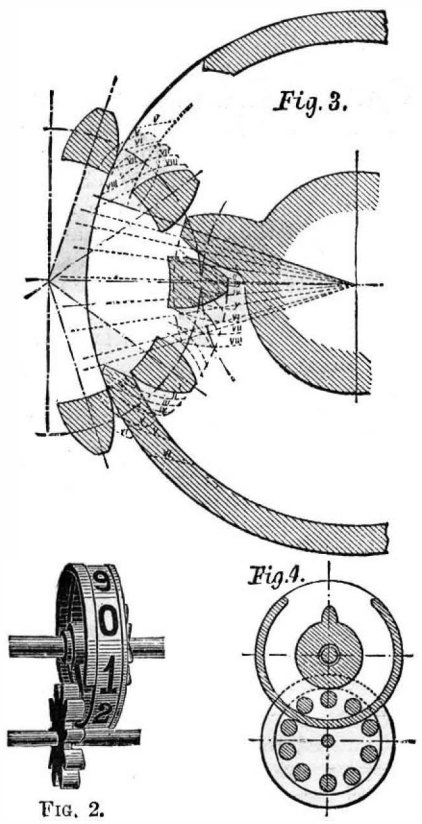


FIG. 2.

IMPROVED MECHANICAL COUNTER.

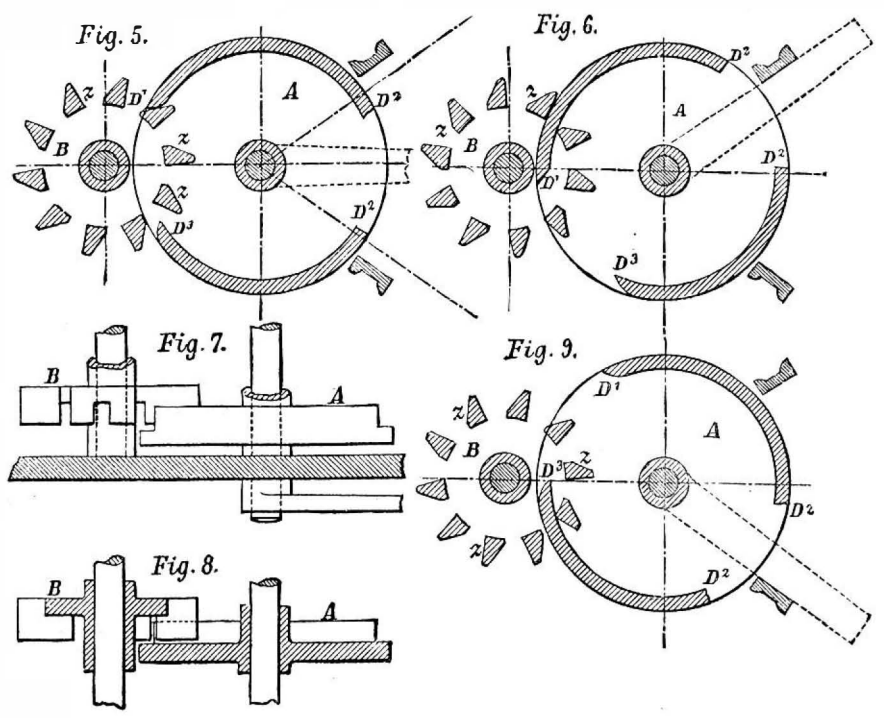
stroke, and the length of stroke of the lever is almost immaterial. Provided it moves over an arc of about 60 degrees, it will turn the number wheels satisfactorily, and if it swing the whole 360 degrees, the result is just the same. It is perfectly immaterial whether the lever reciprocates or whether it rotates steadily either in one direction or the other; in any case the numbers appear in proper rotation, and they are always in line, so that they can be read without effort.

Fig. 1 shows a perspective view of one form of this counter laid upon its back, with the case removed to show the mechanism; Fig. 2 is a detached view of a pair of ring or star wheels; Fig. 3 shows the form of both of these wheels; Fig. 4 shows an alternative arrangement; Figs. 5 to 9 show the device by which the motion is communicated to the number train. Referring to Fig. 1, it will be seen that there are two parallel axes, one carrying the number wheels and the other star wheels; these are both of phosphor bronze. The periphery of each number wheel is made in two portions, one bearing the figures, and the other being a plain band, which serves to lock the star wheel. This plain band has a part cut away (Figs. 2 and 3); and at the time the star wheel is to be rotated, this gap comes opposite the wheel, and thus leaves it free to move. At all other times the band presses between one or two pairs of teeth on the star wheel, and so locks the latter fast.

In order that this arrangement may be practicable, the teeth of the star wheel are much wider than the disk upon which they are mounted, and half this width lies inside the rim of the number wheel (Fig. 2). This half gears with the single tooth shown in Fig. 3, and the other half with a ring of teeth cast on the back of the next number wheel (Fig. 2). This being understood, the action is similar to that of other counters. When the first number wheel has made a complete revolution, its single tooth rotates the star wheel one-tenth of a revolution, and this, in turn, rotates the next number wheel one-tenth of a revotion, and so on.

We now come to the means by which the rotation of the engine or shaft, which it is the object of the apparatus to register, is communicated to the first number wheel. A short spindle (Fig. 1) in the end plate of the counter carries at its inner extremity a disk crank with a crank pin in it. This pin works in a slotted lever, and causes the latter to reciprocate, whether the crank be driven round and round, or merely vibrated. Attached to this lever, which is loose on its axis, is an escapement (Figs. 5 and 6), gearing into an escapement wheel fastened to the main axis, upon which all the number wheels ride, the first wheel being fast to it. Figs. 5, 6, and 9 illustrate the escapement in this position, and show that a very large range of motion can be given to it without danger. A and B are the two wheels; D^1 D^2, the two pallets; *z z*, the teeth.

These counters are made in many different forms; the mode of mounting and fixing has been designed to meet every possible case. They are easy to read, strong and durable, while their great simplicity and handiness must insure them a very extensive use. The makers are Messrs. Trier Brothers, 19 Great George Street, Westminster.—*Engineering.*



IMPROVED MECHANICAL COUNTER.

How She Converted Him.

The *Age of Steel* gives the following account of an experiment of the eight hour system in St. Louis:

Several weeks ago the proprietors of a machine foundry learned that their employes wanted to work under the eight hour rule. The latter were told they might do as they pleased, provided they were willing to accept eight hours' pay for eight hours' work. The proposition was agreed to, and the first day of trial all the men except seven or eight went home early. The next day the number that remained was a little larger, the third day still larger, and so on, until at the end of the week there wasn't a man in the establishment working less than the usual time.

One of the men who experimented with the eight hour rule, in the instance above referred to, tells how he came to change his opinion with regard to long and short time work. We give his story space, because it goes to show what an important factor of the labor problem home influence is. He says: "The second day we tried the eight hour plan I went home and found my wife sitting in the rocking chair, leisurely reading the afternoon paper, and there was not a sign of supper in preparation. Of course, I began to expostulate with her about so unusual a state of affairs; but she made me feel very blank when she looked up and naively remarked that her day's work was over, that she was an 'eight hour man.' The next day I was the last man to leave the shop, and on coming home I found the table spread and the meal waiting me."

Fossil Human Footprints.

Herr H. E. Low has obtained and forwarded to the Imperial Museum in Vienna twelve large stone slabs bearing the footprints discovered last year in the solid rock in the quarry over Lake Managua, in the territory of Nicaragua. The interest was increased by the statement that those footprints had been overlain by eleven different layers of stone, extending to a depth of four meters, and indicating an antiquity for our race quite transcending all conjectures hitherto hazarded. They are about three-quarters of a meter square. They can now be inspected by European geologists. The footprints are sunk into the stone to a depth of from eight to ten centimeters. The stone itself is a porous volcanic tufa, and the superincumbent layers, which had been removed for building purposes, were all of a more or less solid volcanic conglomerate. The footprints are very conspicuous, and seem to be those of three distinct persons, one of whom was a child.

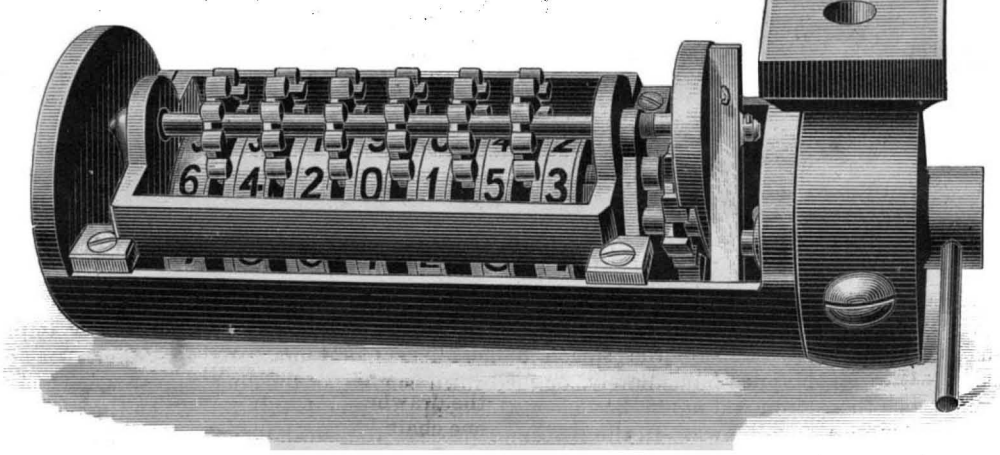


Fig. 1.—IMPROVED MECHANICAL COUNTER.

Cost of Lighting Streets.

The city officials of Baltimore have been investigating anew the subject of lighting streets, in order to understand why that city has to pay so much more than other municipalities in this respect. Under the contract made early last year, Baltimore's cost of maintaining street gas lamps was $36.94 for each lamp per annum, burning only on dark nights, and $46.19 if allowed to burn all night. In comparison the following figures are collected, showing the amounts paid in other cities:

New York	$25.00	Rochester	$18.12
Boston	31.85	Richmond	44.00
Washington	22.00	Dayton	21.11
New Orleans	24.00	Jersey City	25.00
Burlington	25.00	Cleveland	17.50
Auburn	17.50	Baltimore	46.19

It may be interesting also to note the amount of lighting facilities which the larger cities possess. New York has 23,038 gas lamps and 647 electric lights; Philadelphia, 13,555 gas lamps; Boston, 9,781 gas lamps and 401 electric lights; and Baltimore 5,191 gas lamps and 243 electric lights.

Fuel Consumption of 156 Horse Power Engine.

At the Bussery & Verdie Works, at Lorette, France, a Corliss engine built by Schneider & Co., of Creusot, has been driving a train for rolling steel wire rods for four years. Some time since, a series of tests was made, continuing over ten days, to ascertain the fuel economy of the engine. The latter has a 26·59 inch cylinder, a 49·2 inch stroke, and makes from 61 to 64 revolutions a minute. Duuring the test, the billets were uniform in size, and the same size of rods was rolled. A series of diagrams, taken with a Richards indicator, showed that the cut-off varied from four-hundredths to one-tenth of the stroke. The indicated horse power was 156; the consumption of water per ton per horse power was 16·75; and the consumption of coal, which had 15 per cent of ash, 2·5 pounds per hour per horse power.

Fabry's Comet.

The students of Johns Hopkins University have been studying the path of the approaching comet, discovered by Fabry, and find that the celestial wanderer will reach its greatest brilliancy on May 2. At that time it will probably be a very conspicuous object in the western sky for some hours after sunset. Their results do not confirm the early conclusions of the German astronomers, who thought as the result of eighteen days' observation that the comet would remain visible all night. During the first half of May, it will set two or three hours after the sun, and later will rapidly disappear.

Paper for Wrapping up Silver.

Six parts of caustic soda are dissolved in water until the hydrometer shows 20° B. To this solution are added four parts of oxide of zinc and boiled until dissolved. Sufficient water must next be added to reduce the solution to 10° B. Next dip paper or calico into this solution and dry. This wrapping will very effectually preserve silver articles from being blackened by sulphureted hydrogen, which, as is well known, is contained in the atmosphere of all large cities.

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THE CLAPP-GRIFFITHS STEEL PROCESS.

(*Continued from first page.*)

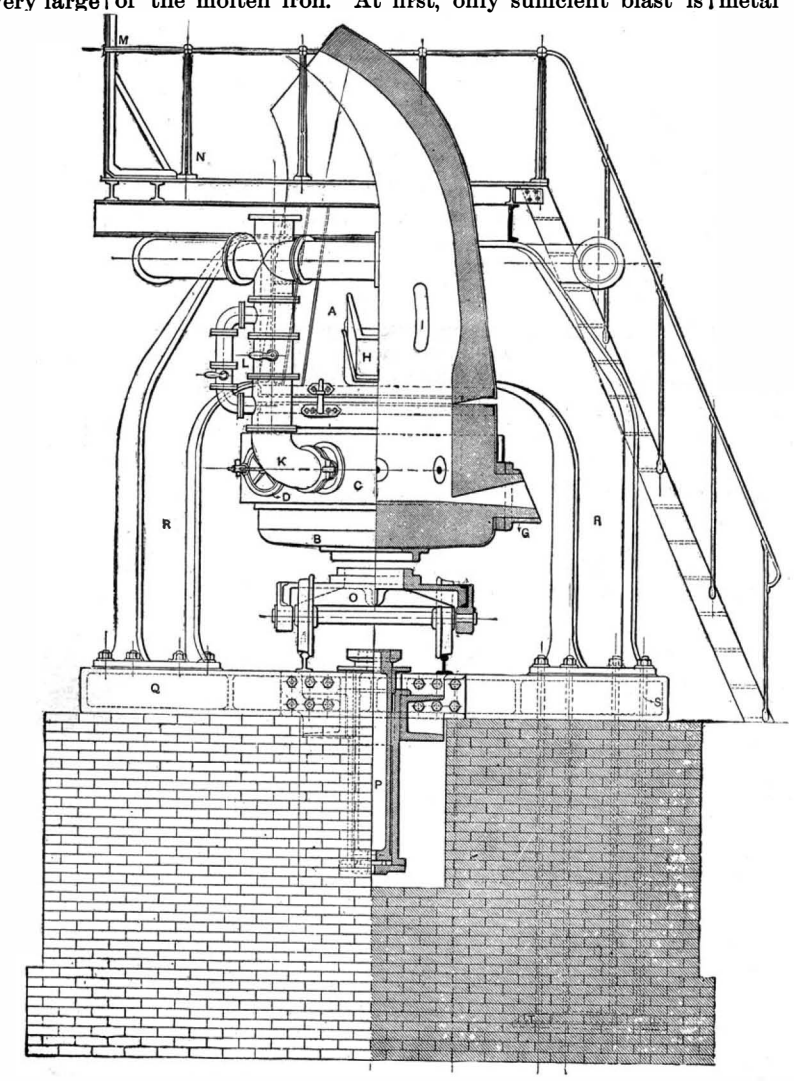
But in spite of all this, the puddling furnace, though so often doomed to extinction, still remains. And it does so for two reasons. In the first place, it is a cheap affair. It can be built at little expense, and can handle a small output, or by easy duplications a very large one. Its mechanical working is, therefore, under easy control. In the second place—and this is the more important reason—the puddling furnace can produce an iron of high grade from indifferent materials. The operation of puddling eliminates phosphorus to a large extent, and it is this feature of the process which, in spite of its other disadvantages, has kept it in vogue. Recognizing these elements, mechanical puddlers, revolving hearths, and similar devices have been brought forward to remedy the existing defects; but while many of them possess considerable merit, they have hardly succeeded in making the system permanently desirable. The demand still remained for a process combining the advantages of an inexpensive plant and an ability to handle cheap grades of pig iron with the easy manipulations and large output of the Bessemer converter.

After an experimental run of several months and the practical operations of something more than a year, the Clapp-Griffiths process has so far demonstrated its ability to fulfill these conditions that metallurgists have turned to it as presenting the best answer to this demand which has yet been offered. The Clapp-Griffiths is a pneumatic system, similar in many respects to the Bessemer, and, like it, is an English invention. The principal difference is in the stationary converter, and the tuyeres in the side instead of the bottom. In addition to these features, the Clapp-Griffiths converter has an open slag hole and a charging hole, both in the side, and a tap hole at the bottom. At first sight these differences appear very small, and in one sense retrogressional, for Bessemer's earliest converters were stationary, and were abandoned for the present style of tilting vessels. But when we come to consider the chemistry of the process, it will be seen that these modifications in the construction of the converter are sufficient to so far change the reactions that the product of the new process is distinctive.

Mr. Griffiths was the engineer in charge of the Gilchrist-Thomas basic process during its experimental stages, while his associate, Dr. Clapp, was a prominent physician in one of the English iron districts. After the consolidation of their interests, the process was submitted to a practical test in Wales. These first plants were small and imperfectly equipped, but the steel they produced had so many admirable qualities that it speedily attracted the attention of American metallurgists.

In the summer of 1883, Messrs. Witherow & Oliver, of Pittsburg, visited Wales, and their personal inspection resulted in the purchase of the American patents. An experimental plant was started in the fall of that year, at the works of Messrs. Oliver Brothers & Phillips. Great difficulty was experienced in finding a suitable lining for the converters, as the fire-clay bricks imported from Stourbridge and Wales burned out almost immediately. Finally, a ganister lining was substituted, with very good results. So many changes, however, became necessary from time to time, more especially in the cranes and other facilities for handling the product, that the plant was not in full practical operation until the spring of 1885.

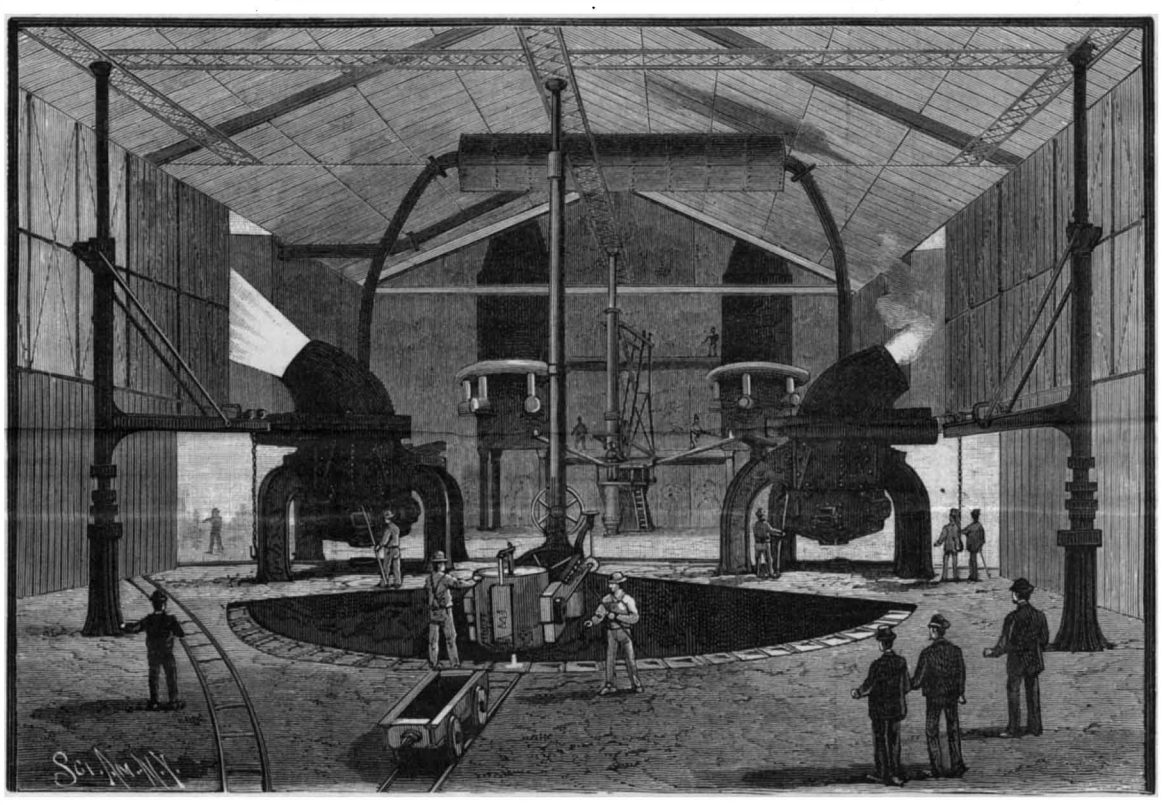
The present plant at Pittsburg consists of two 3-ton converters, and has a capacity of about 125 tons a day. This could be largely increased were the means of handling the ingots with greater facility, at hand. Our first page illustration shows the appearance of these works—the first Clapp-Griffiths plant in America. The pig metal is melted in a cupola furnace, which stands back of the converters, and about 10 feet above the ground level. From this it is tapped into a weighing ladle, which runs on a track alongside the converters. The charging is done through an opening in the side of the converter. The tuyere holes, through which the blast enters, are about 10 inches above the bottom of the converter and 12 inches below the level of the molten iron. At first, only sufficient blast is turned on to keep the metal from entering the tuyeres, but when the converter is fully charged, the blast is allowed to enter the bath under a pressure of six to seven pounds.



SECTION OF CONVERTER AND HYDRAULIC LIFT.

The blow lasts about 15 minutes, the general reactions being the same as in the Bessemer converter. First the brown smoke of burning iron is visible at the mouth of the converter. But this is very soon replaced by the brilliant flame caused by the combustion of the carbon in the pig iron. This, after a time, is in turn succeeded by a flame of smaller volume, but more intense heat, the result of the oxidation of the silicon. The end of the reaction is indicated, as in the Bessemer process, by the disappearance of the silicon flame. The metal must be tapped immediately, or the brown smoke of burning iron will again become visible and the metal will be overblown. In the Bessemer process, the steel, being poured instead of tapped, is very apt to suffer a slight oxidation at this stage of the process, because the blast must be kept on until the vessel is horizontal and the molten bath below the level of the tuyere holes. In the Clapp-Griffiths, however, there is less danger of over-oxidation. When the flame shows the decrease immediately preceding the end of the reaction, the blast is almost shut off again and the metal tapped into a ladle. In some forms of the converter, a differential plunger is used to effect this lessening of the blast, but, while generally in use in Great Britain, it is considered of less value in this country. The metal is tapped very quickly, so that only a few seconds elapse before the bath is below the level of the tuyeres and the blast may be turned off. About 1·1 per cent ferromanganese (76 per cent manganese) is added to the molten iron in the ladle, in order to recarbonize it, and make the product steel.

While the reactions going on in the converter are in general those of the Bessemer process, they differ in degree. There are several points peculiarly characteristic of the Clapp-Griffiths. In the first place, the position of the tuyeres gives an early oxidation of the charge. This is shown in the immediate appearance of the brown smoke of burning iron. It is probable that the almost complete elimination of the silicon, which is characteristic of Clapp-Griffiths metal, is due to this feature of the blow, the oxide of iron formed uniting with the silicon to form a fusible slag. During the blow, limestone is added to furnish a base for the silica. The open slag hole is another distinctive feature of the process. As the metal boils and surges in the converter, a continuous slagging goes on whereby the greater part of the slag is discharged, instead of being mixed with the metal, as in the Bessemer. These differences in the construction of the converter effect a marked change in the composition of the resulting metal. The well known Bessemer engineer, Captain R. W. Hunt, has made a chemical study of the steel, and his results have attracted wide attention from their unexpected character. The product is a very soft steel, containing only from 0·07 to 0·1 carbon, and the amount of silicon is usually so small as to be undeterminable. The best product is of course made from Bessemer pig, but astonishing results have also been obtained from steel made of cheap, phosphoric pig. Steel containing as much as 0·85 phosphorus gave a tensile strength of over 70,000 pounds, while another carrying 0·55 of this element gave a tensile strength of 79,780 pounds, an elongation of 23·5 per cent, and a reduction of area of 35·5. These qualities appear the more remarkable to us, because phosphorus has always been regarded as the one element above all others to be shunned by the iron master. In this process, however, it is rendered comparatively harmless by the almost total elimination of the silicon, and the low carbon. By careful manipulation, the Bessemer process can produce a steel very low in silicon, but there seems to be little dependence upon the certainty of such a result; but in the Clapp-Griffiths process, in spite of the variations in the composition of the pig iron, the silicon is always eliminated. This is a feature upon which the success of the process largely rests, because it makes it possible to produce a good steel with high phosphorus. The limit to which the phosphorus may be carried with safety has not been determined. In the product of the present works it seldom exceeds 0·3, but Captain Hunt's experiments have shown that a much larger amount can be borne without prejudicing the quality of the heavier products, such as nails, shovels, etc. In introducing this process into America, Messrs. Witherow & Oliver have made a great many improvements, unknown in the original converter. One of the most important of these is the movable bottom, shown in our sectional illustration. When the bottom is burned out, the hydraulic lift directly under it is raised, the bottom removed, and a fresh one put in place, the whole transfer occupying but twelve minutes. Natural gas has proved of



THE CLAPP-GRIFFITHS CONVERTERS AT POTTSVILLE, PA.

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great value in allowing a thorough drying of the converter bottoms before being put in place, for upon this depends their length of life. While a few have lasted for 80 and 86 blows, and quite a number for 60, the average life is about 45 blows. The lining of the body of the converter lasts about six months. No salamanders are formed on the sides, as the metal is tapped, in place of being poured. The loss from pig to ingot is about 11 per cent.

The low cost of erecting a Clapp-Griffiths plant is an essential part of the success of the process. It varies, of course, with the locality. Under ordinary circumstances, a two 3-ton converter plant can be put in running order, with all necessary accessories, for from forty-five to sixty thousand dollars. Compared with the hundreds of thousands necessary for the erection of a Bessemer plant, this is a very small sum, and will bring the process within reach of smaller iron works throughout the country. At the present time seven Clapp-Griffiths plants, in addition to the one at Pittsburg, are either in course of construction or have recently been completed. The one at Pottsville, shown in our illustration, has been planned to allow an output of 250 to 300 tons a day. The converters are similar in size and style to those in use at Pittsburg, but the more ample facilities for handling the product will permit a much larger output. At the Oliver Mill, the converters are blown alternately, and are out of blast Saturday afternoon and Sunday. The entire cost from pig iron to ingot steel is here $5 a ton. It was calculated that the cost would be $6 at mills and $4 at blast furnaces where the pig metal could be run directly from the furnace into the converter, and the men formerly employed at the pig bed transferred to the steel department. This, it is thought, will in time largely change the product of our blast furnace plants from pig to steel ingots, dispensing entirely with the puddling process and substituting a soft steel for wrought iron.

At the Pittsburg meeting of the American Institute of Mining Engineers, in the middle of February, the Clapp-Griffiths process was, as at the New York meeting of the year before, one of the chief subjects of discussion. The majority of the metallurgists present were very favorably impressed with what they saw of the operation of the process, and expressed themselves as having great confidence in the important role which it is henceforward to play in American metallurgy. From this verdict a few gentlemen dissented. As the process, however, will soon be in actual operation in at least eight different localities, it will undoubtedly receive extended and careful study, and will be judged from the dispassionate standpoint of whether it is or is not proving a success in the hands of those who have embarked their faith and capital in its practical working. For the present, it is sufficient that the results already obtained encourage a belief in the value of the process and its applicability to the present wants of American iron masters.

Alaska Gold.

A correspondent of the Marquette *Mining Journal* writes glowing reports about the prospects of Alaska as a gold field. He states that the mill on Douglas Island is running to its full capacity, and is turning out bullion at the rate of $100,000 a month, not counting the concentrates, which are rapidly accumulating for the want of sufficient roasters in the chlorination works. The capacity of the mine must not, however, be judged even by the value of both the bullion and concentrates now turned out; it is large enough to supply rock for half a dozen such mills, and the foundations for a second mill of the same size as the one now in operation are already laying. It is estimated that there are at least twenty million tons of quartz above the tunnel level. Concerning the Silver Bay (Fuller) claims, there is nothing new. In the Silver Bay District there are some very rich mines, and all that has been lacking until now has been a reasonable amount of capital to be honestly and judiciously applied in their development. The success of the Douglas Island venture will, it is thought, assure the erection of more stamp mills in Alaska during the next five years than were ever in operation in California and Nevada at one time.

Game Obtained by the Greely Expedition within the Arctic Circle.

In an appendix of Greely's "Three Years of Arctic Service," just published by Messrs. Charles Scribner's Sons, appears the following list of game obtained by the expedition within the Arctic circle in the three years from July, 1881, to June, 1884: One bear, 6 wolves, 32 foxes, 8 ermines, 8 lemmings, 103 musk ox, 57 hares, 35 seals, 84 brent geese, 91 ducks, 702 guillemots, 172 dovekies, 2 ravens, 18 owls, 178 skuas, 12 gulls, 99 ptarmigans, 99 turnstones, 28 knots, 1 sandpiper, 1 sanderling, 21 Arctic terns, 2 gray phalarope, 49 eider ducks, 1 red-throat diver, and 1 salmon. We should have thought the fish caught would have figured for more, especially as one of the illustrations is of Esquimau boys fishing with a line through a hole cut in the ice.

Correspondence.

A Paint to Preserve Ties.

To the Editor of the Scientific American:

I have what I call a "century paint," for posts, railroad ties, etc., made of linseed oil, resin, and charcoal dust. To one gallon of oil put two lb. of resin and enough coal dust to make the mixture the consistency of thick paint. Get the cross ties out of good timber well seasoned. Then dip them about one minute in a large vat of the paint, hot. Wipe off the ties, and they are ready for use. Bore an auger hole in the tie, fill it with the paint, then drive the spike home. I will guarantee *all* the ties treated in this manner to last 20 years. Fifty per cent will last 35 years, and 25 per cent will last 50 years sound. F. M. SHIELDS.

Coopwood, Miss., Jan. 25, 1886.

The Late Mr. Werdermann's Electro Magnetic Drills, Planers, and Lathes.

To the Editor of the Scientific American:

At a late meeting of the Electrical Section of the Franklin Institute, of this city, I made the accompanying statement, the subject matter of which caused some surprise; and as I have never noticed any public mention of it, or of the work having been attempted elsewhere, and as the members of the section could give no solution thereof, I am induced to make the communication to you, for you to make such use of as you may desire, with the view of eliciting from your correspondents, if deemed of sufficient importance, a true solution.

The statement was as follows:

While in London, in 1873–74, on telegraph business, I formed an acquaintance with Mr. Karl S. R. Werdermann (whose late death has recalled some very pleasant hours spent in his company).

On our New Year's Day I received the following note:

"LONDON, 1st January, 1874.

"DEAR MR. CHAPIN:

"I shall be happy to meet you to-morrow (Friday) at 2 o'clock P.M., at your hotel, to go with you to Bermondsey, where you will see some experiments with the magneto electric chucks, which will be, I hope, very interesting to you.

"My best wishes for all your family in the new year. Yours truly,

"R. WERDERMANN."*

The next day, in company with Mr. W. and a party of gentlemen who had also been invited, I visited a large factory at the place named.

On entering, our attention was first directed to a large drilling machine. This was arranged as usual, but the bed plate was cut into two parts, which formed the heads of a large pair of magnets. A piece of iron, about 4 inches thick by 10 wide and long, was placed on the bed plate, and the current being switched on, became firmly secured.

A one-fourth inch drill was then screwed down and the iron drilled through.

No lubrication was used. The particles of iron cut away assembled upon the drill, leaving the hole perfectly smooth—they being removed with the drill; and when the drill was withdrawn, *it*, as also the cuttings, *was found to be perfectly cool, no heat having been* (apparently) *created.*

To satisfy the company, the work was repeated several times, until each person felt assured of the fact stated.

We were then shown the planing machine, which was similarly arranged. A large piece of iron was lying upon the bed plate perfectly secured, although without any bolts or other usual fastening. As the planing tool passed along the face of the iron, we found that the surface was cut smoother than usual, and that there was no heat in cuttings or tool. We were told that the cutting point of the planer required much less attention or repair than in ordinary work.

We were then shown the lathe, the chuck of which was arranged as in the bed plates of the other machines, the current reaching the ends of the revolving magnets by sliding connections.

An iron T connection, weighing about forty pounds, was handled by two men and placed against the face of the chuck. When in right position, the current was switched on, and the iron was held firmly in place.

Change of position was made by striking the iron a sharp blow with a hammer. After one portion of the T had been turned off, it was released by switching off the current and put in a new position, as before.

Here again no heat was apparent, and the tools required very little repairs.

The currents for the work were furnished by a large Gramme magneto machine, the patents of which, for England and America, were owned by Mr. Werdermann.

Mr. W. informed us that he intended to introduce the work into the English Government factories, where cutting tools were kept cool by running water; but whether he succeeded in doing so I never heard.

Mr. Werdermann's solution of the matter was simply: It was supposed that the heat of the cutting tools was absorbed by the magnetized condition of the iron which formed the keeper of the heads of the magnets.

Was this the true solution?

CHAS. L. CHAPIN,
formerly Supt. Fire Alarm Telegraph, New York; lately Gen. Supt. Am. Dis. Tel. Co., Philadelphia.
No. 29 Carlisle Sq., Philadelphia, Pa., March 11, 1886.

*Mr. W. always used his baptismal name of Richard.

The Roosen Fish Preserving Process.

M. August Roosen, of Hamburg, has brought forward a process for preserving fish and meat which depends upon the well known antiseptic properties of boracic acid. The acid is perfectly harmless, and can be taken in quantities of fifteen grammes or more every day without danger to the human system. It is favorably known as a preventive of disease, being strongly recommended in times of cholera epidemic. M. Roosen's experiments covered a series of years. He finds that in the case of small fish, such as herrings, a sprinkling of boracic acid and salt between each layer will keep the fish fresh for a certain length of time if the temperature be kept low. With higher temperature, however, and larger fish the process is not quite so simple. In order to make it complete, steel barrels are employed, which are filled one-third with sea water, in which the antiseptic compound is dissolved. After filling the barrel with fish, the manhole is closed and a pressure pump connected. An additional quantity of water is then pumped into the barrel, the air escaping through an opening which is afterward hermetically sealed. A pressure of six atmospheres is put upon the contents of the barrel before it is closed. This makes the solution penetrate the fish, and prevents the air from finding access to the contents. No blood is drawn out of the fish, and the solution remains clear and pure all through. By the use of boracic acid, mutton has been kept thirty-three days, and still bled freely after that length of time, and fish after several days were found perfectly fresh and sweet.

A High Speed Engine.

During the last last year or two, it has come to be generally understood that large machines, driven at a comparatively low speed, were the best for electric lighting purposes; but the lighting at the Lincoln's Inn dining hall and library must be considered as an exception to this rule. The dynamo here is driven at no less than 12,000 revolutions per minute, by a Parsons high speed engine, which justifies its title by running at the same rate. It requires some mental effort to take a statement of this kind seriously; yet there is no reason to regard the Parsons motor as a toy. It was shown in action at the Inventions Exhibition, running with unimpaired steadiness from the commencement to the close of the show. It is, in reality, a combination of turbines driven by steam, and consists of two series of parallel flow turbines to the right and left of a central steam inlet, the steam exhausting directly from the first turbine into the second, from the second into the third, and so on through 20 turbines in each series. The steam parts with a portion of its energy in each turbine, and finally escapes at a pressure not much above that of the atmosphere. It is claimed that this is the first motor that has ever been made to work at the actual velocity of the steam as it escapes from the boiler.—*Engineer and Iron Trades Advertiser.*

A Powerful Gas Light.

At a recent meeting of the Dublin Royal Society, Prof. F. W. Barrett gave an account of experiments which he had made to test the penetrative power of the Wenham double quadriform burner in fogs. This burner consists of four superposed 88-jet gas burners placed alongside of four similar superposed burners. The eight burners are in one plane, parallel to which, and at the proper focal distance, are eight annular lenses on one side, and a similar set of lenses on the other. The lights blend into one at a distance of 1,500 feet from the lighthouse. The experiments were made on two foggy evenings, on the second of which the fog was so dense as to cut off a powerful revolving light at half the distance, and to silence a fog siren driven by a gas engine and placed beside the Wenham light. The latter was easily seen by the naked eye, and its position determined, at six miles distance. The revolving light in that case was cut off at something under three miles distance. The Wenham burner will be found illustrated in our SUPPLEMENT, No. 526.

A Fire Banked for Sixteen Months.

One of the blast furnaces of the Kemble Iron and Coal Company at Riddlesburg, Pa., was banked up in November, 1884. After being out of blast nearly sixteen months, it was recently opened for the first time, and the fire found still burning. The coke glowed brightly, and on the admission of the blast soon became hot enough to melt cinder. The furnace was started with as little difficulty as if it had only been standing a week.

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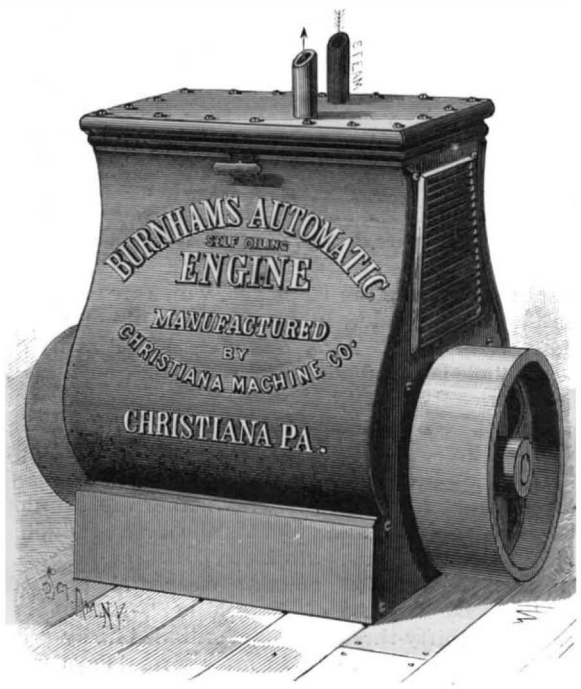
AN IMPROVED AUTOMATIC ENGINE.

The requirements for high speed, smooth working engines have become much more exacting with the increasing use of dynamo electric machines, and engine makers have hence attained a perfection within the past few years, particularly in the making of small engines, which had before been considered hardly worth striving for. Among such improved engines is the Burnham, herewith shown in two illustrations, and which is the subject of three recently issued patents. The inventor, Mr. Nathan F. Burnham, of York, Pa., has here devised an engine which is simple and compact, with comparatively few parts, which is self-oiling, and which can be run at a high rate of speed, while it is economical in the use of steam.



BURNHAM'S AUTOMATIC ENGINE.—FRONT COVERED.

The steam cylinder and valve chest, and their connecting pipes, are secured to the cap plate of the supporting frame, and a slotted tubular guide is secured to the end of the steam cylinder to form an axial prolongation thereof, in which works the slide head and connecting rod attached to the crank shaft. The valve cylinder is bored out and the edges of the ports turned; and when the valve is moved up or down to admit steam, the opening around the cylinder is of equal height, preventing side pressure on the valve. The governor consists of a disk keyed on the crank shaft, on which are weights, adjustable ellipse springs, eccentric, and a counterbalance, by which the lead of the valve can be readily adjusted, and the governor will be perfectly balanced when in motion or at rest. The engine is self-lubricating, stationary oil cups or reservoirs being provided at different places filled with oil-saturated wool, from which a loose wick in a tube leads the oil to the parts to be lubricated, as much as desired being supplied, but without waste, while there are collars which prevent the oil from working out, and facilitate its discharge through holes in the bottom of the casing, for use again or removal.

One of these engines was at work in the Novelties Exhibition at Philadelphia last year, driving an Edison dynamo. It was run for twelve hours daily during the six weeks the Exhibition continued, and was awarded a silver medal and diploma. It was a 5 by 5 inch cylinder engine, and was run at a speed of 480 revolutions a minute, and, although the foundation supporting it and the dynamo was only two hemlock joists laid on the ground and floored over, the work was done without any perceptible tremble. Several offers were made for the purchase of this engine while it was on exhibition, at the price now asked for the same size, which were necessarily declined on account of the pendency of the patents, some of the late improvements of which were not then added. Aside from its other advantages, this engine is especially adapted to run in the same room with other machinery without causing damage by steam or vapor. At the works where these engines are made, Christiana, Pa., new tools have been put in for fitting the parts to the best advantage, the crank shaft and all other wrought material, excepting the connecting rod, being made of steel, and all engines are tested before shipment. The general office is at York, Pa.

A Remarkable Diamond.

In August, 1884, the arrival in London of the celebrated 457 carat fine white diamond, from South Africa, and its subsequent purchase by a syndicate of London and Paris diamond merchants, were announced. The gem was intrusted to the care of one of the most skillful cutters, who has been engaged on the stone during the past eight months, and expects to complete the work in April next. As anticipated, the stone will turn out the most wonderful "brilliant cut" diamond on record, surpassing in weight, as also, it is believed, in color, purity, and luster, all the Crown and historical brilliants of the world. The stone, in its almost finished state, weighs still 230 carats, but in order to give it the best possible shape and luster it is intended to reduce its weight to something under 200 carats. The Koh-i-noor weighs only 106 carats, the Regent of France 136¾ carats, Star of the South 125 carats, and the Piggott 82¼ carats. The Great Mogul weighs 279 carats. It is, however, a lumpy stone, only rose cut, and if cut to a proper shaped brilliant it would probably not weigh more than 140 carats.

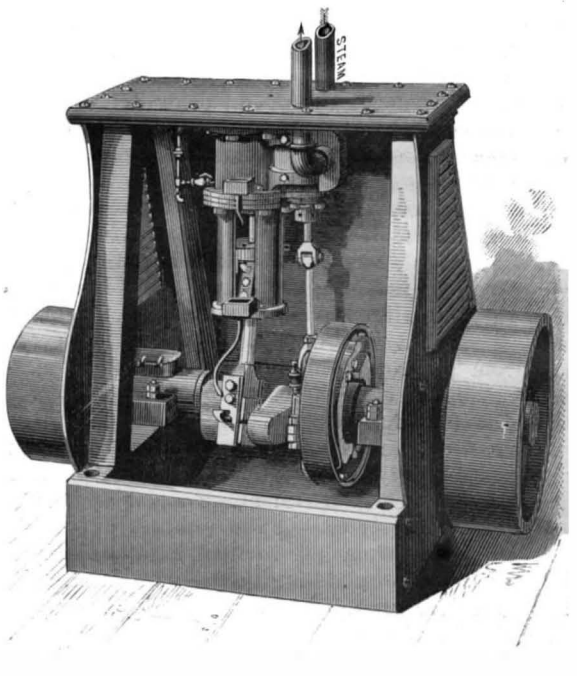
PIPE CUTTING LATHE.

The illustration below represents a lathe for cutting off pipes and for turning them automatically and simultaneously at both ends. The pipes are clamped at each extremity by means of two self-centering chucks. The chucks are mounted within cast iron casings, the bottom parts of which are fitted to slide upon the bed of the lathe, and can be easily shifted by hand, according to the length of pipes, by means of a crank and pinion gearing into a rack. This rack, which serves also for the carriages, is bolted to the one side of the bed for its whole length. Between the cheeks of the bed there is located the driving shaft, with a cone pulley at one end and a pinion at the other end. Two pinions on this shaft, which is grooved on its whole length, engage the toothed surface of the chucks, and travel with them, being held between two collars, which are cast into the casing of the chucks.

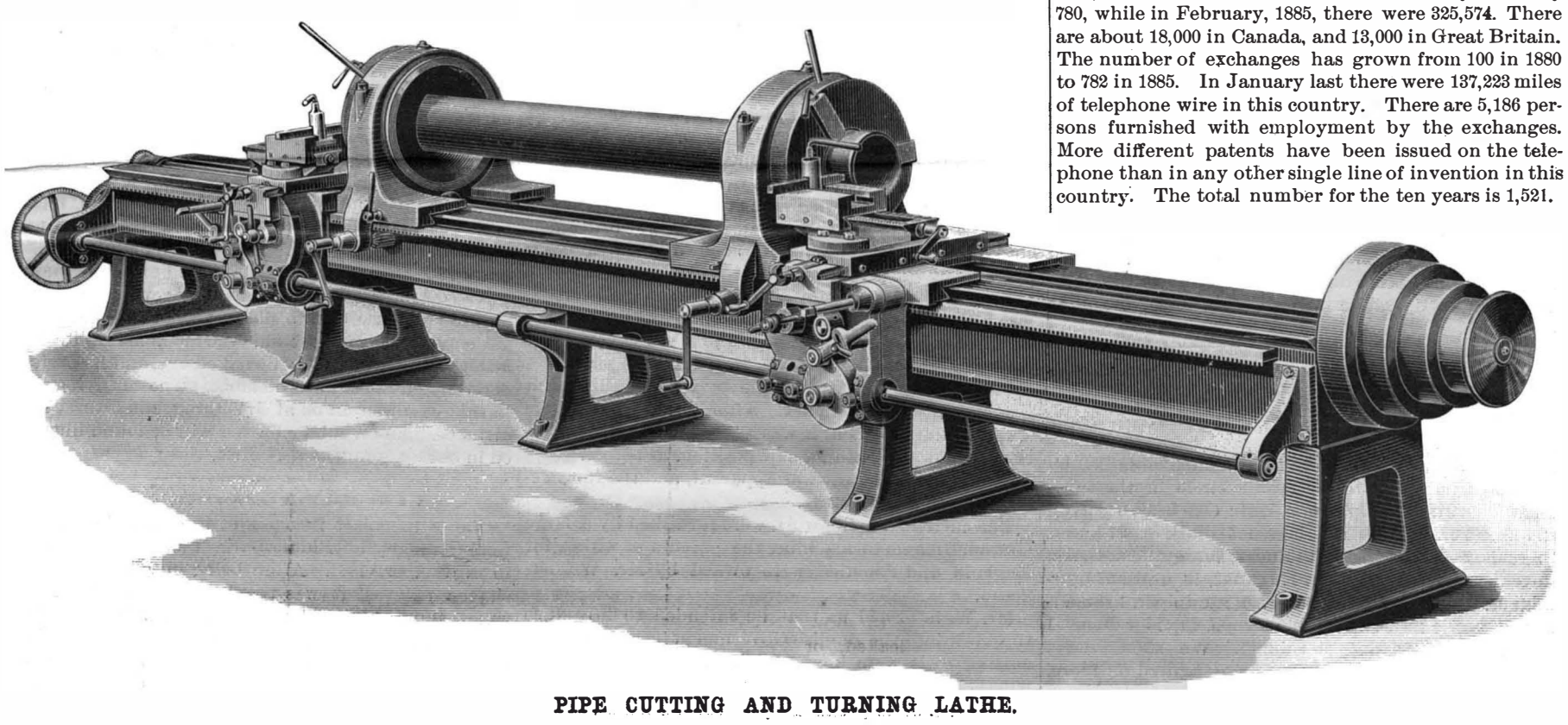
The carriages are self-acting for facework and for turning, and travel by means of a pinion on the rack mentioned above. All the necessary gears for the different motions of the carriage are inclosed in a casing cast into the slides, and are operated through a grooved shaft, which runs alongside of the bed, and is geared by a train of wheels to the driving shaft. These lathes are built in different sizes, either self-acting or by hand. The one shown will turn pipes up to 15 feet long and 8 inches in diameter, and weighs about 4¾ tons.

In order to mount the pipes within the chucks, they are first suspended at their middle portion by means of a rope overhead, and then the chucks may be clamped on the ends, introducing the pipe first into one and moving the other chuck afterward over the other end of the pipe. Where pipes in large quantity and of uniform length have to be manufactured with turned ends, this lathe is very valuable, saving much time and labor.

It remains to be added with regard to the slides of the chucks, says *Engineering*, that these slides, after being shifted by means of the rack and pinion, may be tightly clamped to the slide bars by means of suitable clamps and screws operated by a wrench, such as shown in the engraving. This tool is manufactured by the Werkzeug und Maschinenfabrik Oerlikon, near Zurich.



BURNHAM'S AUTOMATIC ENGINE.—FRONT REMOVED.



PIPE CUTTING AND TURNING LATHE.

A Deadly Tunnel.

The dangers of deficient ventilation have repeatedly been shown in the Mont Cenis tunnel. The ordinary freight train leaving Modane at 9 P.M., the 21st day of December, was observed to come to a standstill at about two miles from the mouth of the tunnel, and did not start again. The conductor of the freight train coming from the opposite direction was informed of the fact, and when coming up to the standing train he found the trainmen on the latter in a dead stupor. They were taken off and transported with all possible speed to Bardonechia, where all of them soon revived. A similar accident happened in the same tunnel only seven weeks before, and both are ascribed to the bad air in the tunnel, which cannot ventilate itself like the St. Gothard tunnel. Luckily, no such accidents have befallen passenger trains, the reason for which may be sought in their more rapid motion.

Growth of the Telephone.

The growth of the telephone is one of the most remarkable in the history of inventions. In August, 1877, the instruments in use in this country was only 780, while in February, 1885, there were 325,574. There are about 18,000 in Canada, and 13,000 in Great Britain. The number of exchanges has grown from 100 in 1880 to 782 in 1885. In January last there were 137,223 miles of telephone wire in this country. There are 5,186 persons furnished with employment by the exchanges. More different patents have been issued on the telephone than in any other single line of invention in this country. The total number for the ten years is 1,521.

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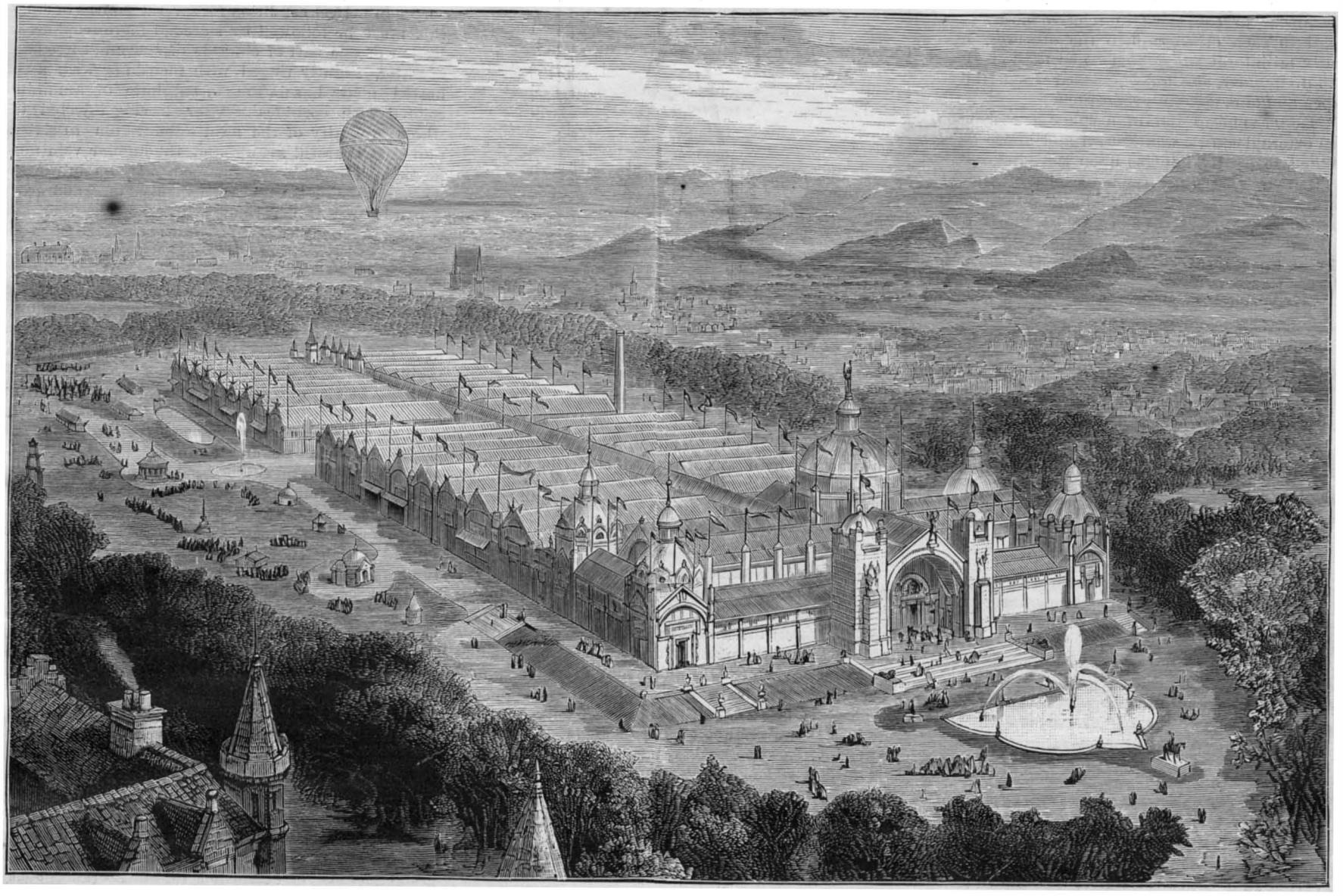
THE EDINBURGH INTERNATIONAL EXHIBITION.

In the summer of this year, under the patronage of the Queen, an important exhibition of industry, science, and art will be held at Edinburgh, says the *London News*, from which we take our cut, the first "international exhibition" in the ancient capital of the Scottish nation, but of which a prominent feature will be the display of the material resources, manufactures, and art treasures of Scotland. The list of patrons includes many influential persons of the Scottish nobility and gentry, with the Marquis of Lothian as president, and the Earl of Aberdeen and the Provosts of Edinburgh and Glasgow as vice-presidents; Bailie Clark is chairman of the committee; Messrs. R. Hutcheson, of Carlowrie, James Gowans, Dean of Guild, and Councilor Andrew Ritchie are the vice-chairmen. The exhibition will be divided into the following classes: Minerals, mining, quarrying, and metallurgy; pottery, glass, and kindred industries; chemistry, pharmacy, and food, including drinks; animal and vegetable substances, and their manufacture; paper, stationery, printing, and bookbinding; steam engines and other "prime movers"; metal manufactures; railway, tramway, and carriage appliances; engineering, building, and ship building; furniture and decoration; scientific apparatus; educational apparatus; fishery and fish curing; the fine arts; and reproductions of the streets and architecture of "Old Edinburgh," with artistic industries represented in the city guilds and crafts, and the historical costumes of the fourteenth, fifteenth, and sixteenth centuries. The site, placed at the disposal of the committee by the Town Council of Edinburgh, is in one of the finest and most accessible parks in that beautiful neighborhood. The exhibition building, of which we give an illustration, is designed by Messrs. John Burnes & Son, architects, of St. Vincent Street, Glasgow, and is being erected under their superintendence and that of Mr. Charles J. Lindsay. We shall probably give a further account of the progress of this exhibition.



THE BUILDING FOR THE INTERNATIONAL INDUSTRIAL EXHIBITION AT EDINBURGH.

Artificial Lithographic Stones.

The *Patent Blatt* describes a process, introduced by M. Rosenthal, of Frankfort, for making artificial lithographic stones. The ingredients consist simply of cement. In the first place, a sufficient quantity of finely ground cement is mixed with water, and allowed to harden in slabs, either in the open air or in an oven. When the cement has set, these slabs are wetted and heated until they crack in all directions; it is then reduced to a fine powder, and is well mixed with an equal quantity of fresh cement. This mixture, in a dry state, is put into strong cast-iron moulds and subjected to a pressure of from thirty to thirty-five atmospheres. A sufficient quantity of water is then introduced on one side of the mould, and is drawn through the mass of dry powder by means of a pump connected with the opposite side; this water contains a certain quantity of finely powdered cement, which is thus caused to penetrate through the mass, expelling at the same time the air and cementing it firmly together. The artificial stone is subjected to further pressure. In this manner slabs of the required size can be formed economically. Carbonate of lime may be substituted for cement, in which case the stones are of a lighter color.

Fires from Steam Pipes.

Some of the facts brought out in the course of the discussion upon the setting of wood on fire by steam pipes, which occupies considerable space in several technical journals just now, point strongly to the desirability of instituting somewhere a connected series of experiments on the subject, the results of which should be made public for the general benefit. It is remarkable that several writers have recently mentioned, as the result of their experience, that woodwork near a leaky joint in a steam pipe, or exposed to escaping vapor, has been charred, and even set on fire, while the much higher temperature of a perfect pipe, carrying steam under pressure, is always, so far as they know, borne with impunity by wood in contact with it.

Running over in our mind, by the light of these observations, the examples which we recollect of fire set by steam pipes, it strikes us as it never did before, that watery vapor may have been present in all the instances, and may have played a part in exciting combustion which ~~has been hitherto unnoticed~~ and unexplained. If it should be shown that the presence of moisture is necessary to the kindling or charring of wood subjected to a temperature of 212°, not only will the discordant assertions of those who do, and those who do not, believe that steam pipes can set wood on fire be reconciled, but a very important advance will be made in the science of safe construction and protection against fire—and there are many indications that this is really the case.

While there are thousands of examples of woodwork remaining for years with perfect safety in contact with high pressure steam boilers or pipes, perhaps half the examples of combustion excited by the heat of steam show obviously that the moisture as well as the heat of the vapor had something to do with the result; and in the other examples, so far as we know, there is nothing to show that the incendiary pipes may not have leaked, or that the woodwork consumed may not have been moist with water derived from some other source. With heat and moisture together, it is now pretty evident that wood may be charred at a comparatively low temperature. We can ourselves remember a case where the cover of a house hot water tank, the thermometer in which would probably never rise to 200°, was found, after some years of use, to be deeply charred; and it may be fairly questioned, not only whether the heat of steam without water is capable of kindling wood, but whether moisture, with a comparatively feeble degree of warmth, may not be more dangerous than has been hitherto suspected.—*American Architect.*

An English Patent Filter.

After having described his invention (a charcoal filter), the inventor concludes with the following statement: "I first became aware of the purifying qualities of charcoal some twenty years ago, in the course of my readings and practice as an operative chemist, but it never occurred to me to apply it to the purification of water until the early part of last summer, when I at once gave my whole soul to the subject, and have continued incessantly to pursue it with all my energy during eight months, strengthened by the hearty and efficient co-operation of my dear wife, the support of our brother Sampson, the enthusiastic admiration of our dear friend, Mr. Robert Noyes, and our brother-in-law, Mr. William Neeld, the cheerful assistance of our several women, particularly Martha Heath and Betsy Jebbs, and the warm smile of an enchanted public; particularly the dear little ones, who clasp the cold, sparkling chrystal with both their tiny hands and lift it to their sweet, quivering lips. To some this may seem irrelevant, but I feel it a tribute to justice which gives me inexpressible pleasure to render, for without such aids it would have been a physical impossibility for me to have brought my invention to a successful issue." This forms a striking contrast to the dry and prosaic style usually found in patent specifications. The specification is dated A.D. 1860, and numbered 1861.

A CORRESPONDENT in one of our contemporaries says that a common feature of traveling shows in Japan is a realistic view of Jigokee, or the Buddhist hell. The figures represented move by machinery, and include a selection of as terrifying devils as ever were depicted in a temple kakemono. One well developed devil is weighing new arrivals at the gates in a balance, and directs them to the right or left—to Heaven or Hell—according as they tip the scale or are found wanting. The tortures inflicted on the wicked receive ample attention. The braying in a mortar, pounding with an iron mace (spiked), sawing in two, and dragging out of the entrails are all on view. The most business-like earnestness is displayed by the various figures, one green devil being specially noticeable.

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Alcoholism Incompatible with an Accurate Perception of Facts.

BY T. L. WRIGHT, M.D., BELLEFONTAINE, O.

The accuracy of the mental apprehension of facts depends very much upon the more or less complete consciousness of the mind when the facts are under observation.

In complete anæsthesia there is entire unconsciousness, because, there being no sensibility, there can be no perceptions offered or received.

In every subordinate *degree* of anæsthesia there must be a corresponding degree of imperfection in the perceptive function.

When the nervous system is in a condition of partial anæsthesia, such as always supervenes during the alcoholic impression, the knowledge of facts is infallibly darkened, and in several ways:

First, the insensibility of the nervous system causes the facts to be presented in a clouded manner. Events are enveloped in a mental haze which renders all conceptions of them undefined and often very incorrect. When the sense of vision is obscured by conditions exterior to the body, as, for instance, by a foggy atmosphere, the appearances are materially changed with respect to the actual situation of surrounding objects. Not only are outlines indistinct and deceptive, but objects appear to be placed in relative positions with regard to each other, and to the observer, such as greatly misinform the judgment as to the real facts. Not infrequently, also, objects appear wonderfully misshapen and of monstrous proportions.

If, then, the incapacity of a single sense dependent upon external causes, well known and appreciated at the time, so greatly imposes upon the mind, it cannot be otherwise than that the incapacity of the whole nervous system through alcoholic anæsthesia should prove radically misleading in a vast number of particulars.

Again, the facts presented to the unstable or wavering attention, in a condition of alcoholism, are liable, through defective sensibility, to appear in *parts* only —that is, fragmentary, and, of necessity, lacking in that completeness and unity of character that is essential to a truthful appreciation of them.

But the mind, under the sway of alcoholic anæsthesia, is unconscious of its infirmities. The toxic power of alcohol, operating wholly from within, gives no appreciable sign of its impostures. There is no corrective to misinformation, as there may be in the case of enveloping mists, deceiving the eye—that is, through the co-operative and conservative action of the several senses. On the contrary, the avenues to knowledge, in alcoholism, are all obstructed, and the senses operate in unison to betray.

The consequence is that the convictions of the mind under anæsthetic influences are like mental convictions in brain disease. They are not fully amenable to the modifying influences of ordinary comparison and evidence. Like the delusions of the insane, they become imperative and unalterable.

And thus it happens that the sober and conscientious witness will testify to the truth of events which were largely illusions of the perceptions in intoxication; and which, morever, give rise to delusions of the understanding when sober. In no respect, however, is the power of alcohol, in weakening judicial testimony, more aggressively prominent than in its invariable interference with the usual methods assumed by the mind to measure the passage of *time*.

In criminal jurisprudence it is well known that the effects of alcohol very often enter as prime factors, not only as to principals but also as to witnesses. But in all criminal investigations, the "time when" of an event becomes as important a consideration as the "place where;" so that when crime is under investigation, the *time* of an occurrence is generally one of the decisive points in question.

There must be a normal and customary succession of events—or, perhaps, it might be said, a succession of perceptions—applied to the conscious mind, in order to appropriately arrive at a true conception of the actual passage of time. The mind, at stated intervals, must come, through the perceptive faculties, into immediate relationship with the world exterior to it, or the idea of time will be surprisingly erroneous. No matter if ideas are fixed or slow, no matter if they are swift or maniacal, there is no idea of the flight of time without this periodical return of the conscious mind to the material world—to the "things of time and sense."

But in alcoholism, anæsthesia prevents the regular and normal operations of the perceptive faculties. Nothing more astonishes an intoxicated man than to give him the true time.

How, then, can a witness, be he ever so honest, testify as to the time of an event observed by him while in a state of inebriation? He may say he informed himself respecting the time "soon" after the occurrence in question; but how can he know how long a period that "soon" occupied?

Alcohol is antagonistic to the right perception of facts, and, of course, also to accurate testimony respecting facts observed under alcoholic impressions. It mystifies facts, it distorts truths, and it annihilates time.

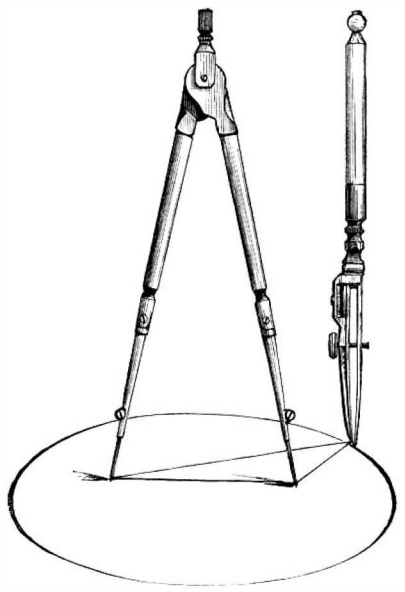
In all judicial proceedings of great moment, when stupendous interests in property, or liberty, or life are at stake, the testimony of witnesses respecting facts observed while in a state of intoxication should be viewed with the utmost suspicion.—*Q. Jour. Inebriety.*

A NOVEL ELLIPSOGRAPH.

H. T. Hozard, of Los Angeles, Cal., has devised an instrument which may be attached to the blade of an ordinary drawing pen, and held in position by the adjusting screw of the pen.

On the attachment to the blade of the pen is mounted a revolving drum, on which a double thread is wound. The thread passes through a hole near the point of the pen, and forms a loop; by placing this loop around the legs of a pair of dividers, keeping the cord taut, a perfect ellipse will be drawn. The size or shape of the ellipse is regulated by rotating the drum, to enlarge or diminish the loop, and by increasing or diminishing the distance between the points of the dividers.

A similar attachment has been designed for an



HOZARD'S ELLIPSOGRAPH.

ordinary lead pencil, to meet the want of such an implement in the workshop.

These ellipsographs are manufactured by F. W. Devoe & Co., corner of Fulton and William Streets, New York.

Gum Ferment.

Gum arabic is found, by J. Wiesner, to contain a diastasic ferment, which is also met with in nearly all the different varieties of gum, in mucilage, in linseed, and many other similar substances. It exists in those tissues of the plant which are characterized by the transformation of cellulose into gum. It appears that this ferment is incapable of decomposing the glucosides. It does not convert proteids into peptones, nor has it an inverting action on sugar. It converts starch into dextrine, and arabine into bassorine.

The gum ferment may be detected by boiling the substance which contains it with orcinol and strong hydrochloric acid, when a red coloration is soon produced; the liquid then turns violet, and deposits a blue precipitate, which is soluble in alcohol. The gum ferment is decomposed by boiling in water for an hour and a half. Finally, we are told that the presence of this peculiar ferment interferes with the conversion of starch into sugar by bacteria or by diastase.

It is supposed that the conversion of cellulose into gum or mucilage in living plants is due entirely to the presence of this gum ferment.

The Impermeability of Glass by Gases.

The question has sometimes been asked whether glass is permeable by gases, and, as reported in the *Nuovo Cimento*, Signor A. Bartoli has conducted some experiments with a view to deciding it. The method adopted for this purpose was exceedingly delicate. Two electrodes of gold, B and C, were glued upon the two faces of a glass sheet, separating into two compartments an electrolytic cell hermetically closed. Each of these compartments contained a solution of sulphate of soda and a second electrode of gold. The two electrodes, A and B, of one compartment were in permanent connection with a galvanometer remaining constantly at zero. Under these conditions, the two other electrodes, C and D, were connected with a rather powerful battery, when the galvanometer failed to show the slightest effect. It is concluded from this that glass, at least such as was used in this experiment, is perfectly impermeable by oxygen or hydrogen; for an otherwise imperceptible trace of either gas would have sufficed to produce an appreciable polarization of the sheet. It does not appear, from the report, which is briefly translated for the *Journal de Physique* by M. Bouty, whether these experiments were of a protracted character, or whether different descriptions of glass were used in the trial.

Embalming.

A. Sauter (*Der Fortschritt*, No. 3, February 5, 1885; Ferd. Ad. Junker, M.D., London, *Med. Rec.*) describes several cheap and easy methods of preserving and embalming bodies. If only a temporary retardation of putrefaction and decomposition be required, the filling up of the coffin with sublimated wood wool will answer better than any other means, being at the same time easily procured and prepared. Common wood wool, which may be purchased of any surgical dressing manufacturer, is treated with a solution of one part of bichloride of mercury, 100 of alcohol of 5 to 10 per cent, and dried for use. Instead of wood wool, common sawdust prepared in the same manner will likewise answer. The corpses ought to be previously washed with ten parts of water.

The best and easiest manner of embalming consists in gradually injecting, under gentle pressure, the preservative fluid into the carotid artery by means of an Esmarch's irrigating can, or by a larger ordinary injecting syringe. The quantity required will vary between six to eight pints (three or four liters), consisting of one part of carbolic acid, ten of glycerine, fifty of alcohol, and forty of water. This fluid will preserve the body, and retain the epidermis for several days. If, however, it be desired to keep the corpse in perfect condition for several months or longer this must be followed by a second more copious injection of one part of chloride of zinc and three parts of water, slightly tinged with fuchsin or with a saturated neutral solution of sulphate of aluminum colored with cochineal. After having injected the whole quantity of the fluid (about ten to sixteen pints), the carotid artery and the jugular vein must be tied. The surface of the body may be lubricated with vaseline or covered with varnish of sandarac, to which 1 per cent of carbolic acid is added. The cavities of the body are filled with sublimated wood wool, or with cotton wool soaked in glycerine containg 5 per cent of carbolic acid.

These methods of preserving corpses will neither require unusual skill nor be very expensive.

A Frenchman suggests that bodies be copper-plated as a means of preservation. He has tried the experiment successfully on small animals. The copper shell can be plated with nickel, silver, or gold. Whatever use may be made of this as a method of preservation, it is useful as a means of obtaining facsimile casts for demonstration. Broca, some years ago, described a process for metalizing a brain. The organ is first hardened, then immersed in a solution of nitrate of silver, and then exposed to the action of sulphureted hydrogen; a metallic sulphide is thus formed, which acts the same as the blacklead coating employed in electrotyping. The organ thus prepared is placed in the bath, the process being the same as in electro-metallurgy. A very thin deposit is all that is required. The brain is removed through a small hole, the interior washed out with strong lye, and then, after drying, the shell is filled with plaster of Paris.

The Philosophy of Vaccination.

Professor Tyndall explains the philosophy of vaccination as follows: "When a tree or a bundle of wheat or barley straw is burned, a certain amount of mineral matter remains in the ashes—extremely small in comparison with the bulk of the tree or of the straw, but absolutely essential to its growth. In a soil lacking, or exhausted of, the necessary constituents, the tree cannot live, the crop cannot grow. Now, contagia are living things, which demand certain elements of life, just as inexorably as trees or wheat or barley; and it is not difficult to see that a crop of a given parasite may so far use up a constituent existing in small quantities in the body, but essential in the growth of the parasite, as to render the body unfit for the production of a second crop. The soil is exhausted; and until the lost constituent is restored, the body is protected from any further attack from the same disorder. Such an explanation of non-recurrent diseases naturally presents itself to a thorough believer in the germ theory; and such was the solution which, in reply to a question, I ventured to offer nearly fifteen years ago to an eminent physician. To exhaust a soil, however, a parasite less vigorous and destructive than the really virulent one may suffice; and if, after having, by means of a feebler organism, exhausted the soil without fatal result, the most highly virulent parasite be introduced into the system, it will prove powerless. This, in the language of the germ theory, is the whole secret of vaccination."

New Treasurer for the Blake Manufacturing Co.

We learn that Mr. E. C. Turner will probably succeed his father, lately deceased, as treasurer of the George F. Blake Manufacturing Company, Boston, Mass. Mr. Turner is a gentleman of much business experience, and combines therewith the rare qualities of active enterprise and good judgment. He is admirably qualified for the duties of the position.

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ARMOR FOR VESSELS, FORTS, ETC.

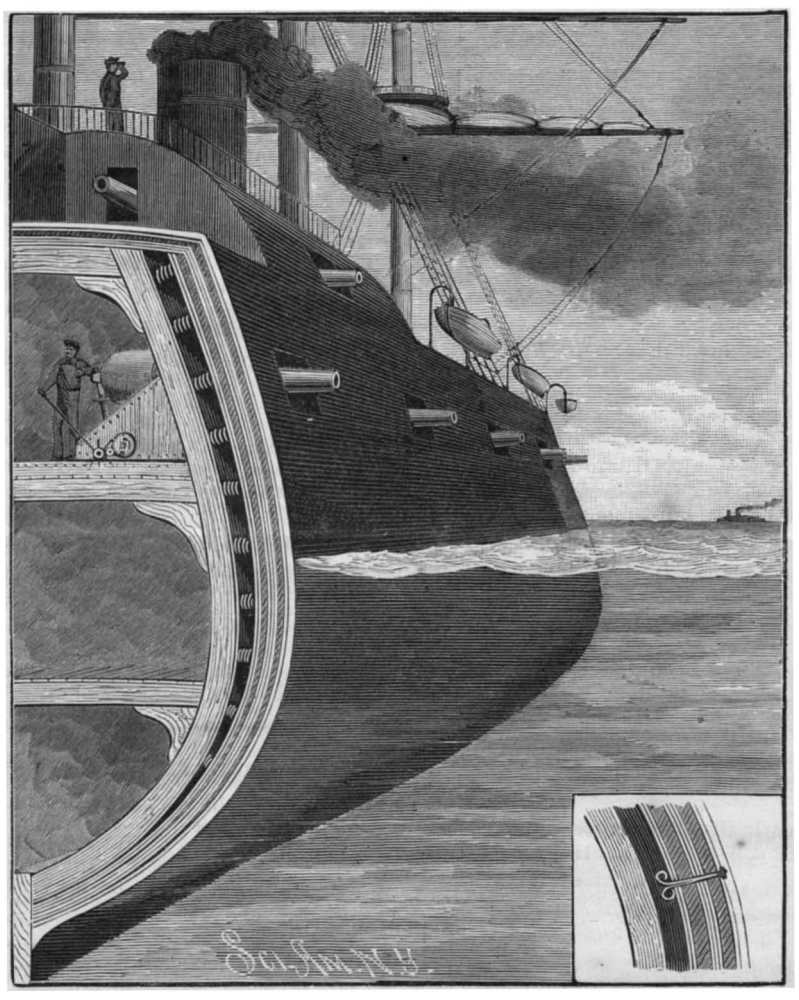
It is known that a shot will not penetrate a yielding obstruction as readily as it will a rigid one, and for this reason springs of different forms have been interposed between the plates and hull of a vessel, or between the plates themselves, to admit of their yielding when struck. The object of the invention herewith illustrated, for which letters patent have been granted to Mr. Wm. N. Le Page, of Gloucester, Mass., is to provide an armor which shall combine the advantages of a yielding, hard, and tough armor, and which is therefore well adapted to protect ships, batteries, and forts against the destructive action of missiles.

The armor can be formed of any desired thickness by alternating one, two, or more layers of plates made of steel or iron with a cement composed of asbestos, glue, hair, and cork, covering the outside with a plate of chilled steel, and interposing springs between the hull and plating thus formed. The engraving represents three layers of plates separated by two of cement or composition. The space occupied by the springs is made air tight, thus forming an air cushion whose elasticity materially assists that of the springs in resisting the shock.

The shot, when striking the chilled steel coating, will glance, the hardness of the metal and the yielding of the armor preventing it from gaining any hold. Striking the armor at right angles, the shot will be seriously obstructed in penetrating the steel coating, and in penetrating the layers of plates beneath it will be more effectually obstructed on account of the cement, which prevents the plates from flying in pieces, and offers great resistance in itself on account of its combined hard, fibrous, and elastic nature. In addition to the resistance thus obtained, the yielding of the outer portion of the armor by the compression of the heavy springs and of the confined air serves to prevent great penetration, and the shot is brought to rest before it reaches the hull of the vessel or face of the fort. The layers of cement prevent the plates from cracking for a great distance when struck, and, in case of boats, prevent the water from reaching the side of the hull through breaks in the outer layers of armor.

The small sectional view shows a modification in which the spiral springs—shown in the large view between the wooden and outside plating—are replaced by bolts, the heads of which are covered by the thick outside plating of chilled steel, and the shanks are split and then curved to form spiral springs, which press against the inner plate. This construction is designed to more surely bind together the plates and their separating material, without in any degree affecting the strength or elasticity of the structure, as the springs tend, after the plating has been struck and bent, to force the plates back to their original position.

It is claimed that this plating can be advantageously applied to the forts of this country, the walls of which would serve merely as a foundation upon which to secure the plates. The springs, by serving to distribute the shock over a large area, would render unnecessary the rebuilding of the walls, which, to serve this purpose, now possess ample strength. It is also claimed that, considering the results to be obtained by rendering the now useless defenses useful, this method could be more economically applied than any other.



LE PAGE'S ARMOR FOR VESSELS, FORTS, ETC.

Tall Chimneys.

The Mechernich Lead Mining Company completed last year a chimney stack of the following leading dimensions: The height is 134·6 meters (440 feet 6 inches). The foundation, dressed stone masonry, is 36 feet square and 11 feet 6 inches high. The base, a cube of 32 feet 9 inches, and the octagonal plinth of the shaft are both built of annular kiln bricks. The circular shaft is formed of radial bricks. It is 24 feet 6 inches outside and 11 feet 6 inches inside diameter at the base. At the top, it is 11 feet 6 inches outside diameter and 9 feet 10 inches inside diameter. The Port Dundas (Glasgow) chimney is 488 feet from the foundation to the highest point of the lightning conductor, or 468 feet from foundation to cope stone.

A FIRM which makes a specialty of the erection of shafting states that its experience teaches that the loss of power due to improper conditions in the line shafting amounts to fifty per cent of the engine power employed, and that the defects most commonly found are as follows: Shafting too light for the duty, crooked shafting, hangers too far apart, hanger bearings too short, pulleys too heavy and not properly balanced, hangers which are not adjustable and not self-adjusting, and sometimes filled with spurious Babbitt metal, and improper proportion between two pulleys connected by the same belt.

A Sound Trademark Decision.

Judge Brown, in the United States Court (Detroit district), recently rendered a decision upon a question in which every maker of a proprietary article is interested. In an action brought by the Royal Baking Powder Company against the "Coral Baking Powder," for using a label and package similar to that of the complainant, there was no claim that the name of the "Royal" Company had been used, but it was alleged and proved that the cans were like those used by that company, and that the labels, in color, design, and general arrangement, were substantially similar. The defense insisted that the plaintiff's right in its trademark was limited to the name. The court held otherwise, deciding that the use of labels having the same color and general appearance, with a similar arrangement of words and similar device, was calculated to deceive purchasers into buying one product for the other, and was therefore an infringement of the plaintiff's trademark.

Table Ware from Slag.

A contemporary reports that the slag resulting from the smelting of copper, gold, and silver ores at Argo (Colorado) is now used for the manufacture of beautiful table ware. The colors are a kind of spray of onyx and opal flushed in waves throughout the ware. The colors, it is stated, are under perfect control, the slag containing a larger percentage of material necessary than can be found in slag elsewhere. The slag is melted at an intense heat, then poured into vats of agitated water, then remelted and poured into moulds either with or after an acid mixture that causes the metal to flux pretty generally with added materials. The result is said to be a metallic glass with the strength of light cast iron, which may be moulded into any form of table ware, bowls, cups, tumblers, etc., with the most beautiful sprays of onyx stone colors upon a general background of opal.

Artificial Cocaine.

W. Merck has announced the artificial formation of cocaine, which is probably the first step toward cheapening the production of this important alkaloid. He tells us that cocaine may be prepared by heating benzoylecgonine, with a slight excess of methyl iodide and an equal volume of methyl alcohol, in a sealed tube at 100 deg. C.

This is not, exactly speaking, an artificial formation of cocaine, but the conversion into this base of another substance contained in the coca leaves, which has hitherto been a by-product of little or no value.

Another chemist, Z. H. Skraup, has confirmed Merck's observation just alluded to. He also shows benzoylecgonine to be a by-product in the preparation of cocaine. It crystallizes in transparent prisms. The acetate and sulphate also crystallize in prisms. By the action of hydrochloric acid in sealed tubes at 100 deg. C., it is decomposed into methyl chloride, benzoic acid, and ecgonine. This author also says that benzoylecgonine is converted into cocaine by the action of methyl iodide in the manner described above.

Astronomical Notes.

The new star in the constellation Orion, which was discovered by Lord Crawford's astronomers at Dun Echt Observatory, presents, according to the French astronomer, M. Wolf, some characteristics which completely distinguish it from the two temporary stars which have been discovered since the application of the spectroscope to the study of these bodies. The star T of the Crown, observed in 1866, and that of the Cygnet, which appeared in 1876, both offered at the moment of maximum splendor a spectrum of dark rays on which a number of brilliant lines were seen, those of hydrogen in T, and those of hydrogen, sodium, magnesium, and the green rays of nebulæ in that of the Cygnet. Since then these lines have by degrees disappeared; T of the Crown has a continuous spectrum, and the star of the Cygnet no longer only shows the green rays of a nebula, a singular instance of the transformation of a star into a planetary nebula. The new star in Orion gives a spectrum appertaining to Class III., section *a*, of Vogel; and it is furrowed by a series of black bands on a luminous bottom. These bands, to the number of seven at least, are distinctly ended on the violet side and fade away on the red side. At first sight some in the green and blue seem to terminate in a bright line. The spectrum is also remarkable for the splendor of the red and orange, a fact which accounts for the color of the star, but, contrary to what usually happens in orange stars, the more refrangible part is much prolonged. The sudden appearance of this star cannot be attributed, in M. Wolf's opinion, to an incandescence of gaseous masses in the chromosphere. Its spectrum is, in fact, similar to one of the most marvellous stars of the heavens, namely, Mira Ceti, or *o* of the Whale. M. Wolf concludes that the new star is not a temporary star, but a variable star become visible to us by a sudden increase of conflagration. Even at the moment of its maximum splendor it was hardly visible by the naked eye.

Although invisible to the naked eye, there are at present three comets in the heavens which may be observed with the aid of telescopes. One of them, discovered last year by Mr. Brooks, is about to disappear; but the other two are gradually increasing in brilliancy, and will probably offer a most imposing spectacle to the naked eye in the western sky for several weeks from the third week in April. They will be approaching each other for some time, taking their common course toward the north pole of the firmament until about April 30, when one will reverse its path, sinking finally below the northwestern horizon. This comet was discovered on December 2, last, by Mr. Barnard, and bears at present his name. The other, discovered on December 1, by M. Fabry, of the Paris Observatory, is known by the latter's name. Both comets have this peculiarity, that their individual orbits vary, although they are somewhat similar generally, and that both will be seen very distinctly toward the end of April, close together, every evening between 8 and 9 P.M., below the zenith in a north-northwest direction. Barnard's comet is now close to star *a* of Aries, and will take its course toward the constellation of Andromeda, so that toward the end of April it will be to the right of star γ, when it will become visible to the unarmed eye. Then it will turn again toward the south, increasing its brilliancy rapidly, crossing the constellation of Aries for the second time, in the direction of Eridanus. It will now become invisible in the northern hemisphere, but may be observed for some time after in the southern part of our globe. Fabry's comet is now to the left of star β in Pegasus, and by April 1 will have wandered to 9° northward, into Andromeda. Then it will turn toward the constellation of Cassiopeia, become visible to the naked eye, enter, in the second half of April, Perseus, and will be of extraordinary splendor at the beginning of May. Its further course, becoming more rapid, will lead past the brilliant star of Capella, so that, toward the middle of May, it will be seen at 10 P. M., low in the western horizon, after which it will gradually lose its brightness in its southward course, and disappear below the horizon.

SOME experiments have been made by Mr. G. Sacheri to test the flow of water through a lead pipe. The length was 3,419 ft.; the gradient for a length of 102 ft. was 1 in 10·5, and for the remaining distance 1 in 142·86. The pipe was quite new, and of a diameter of 25 millimeters (0·984 in.). The head of water was 29·2 ft., and the discharge was found to be 0·02036 cubic ft. per second, giving a mean velocity of 2·338 ft. per second. The high rate of discharge is attributed to the good surface of the new pipe.

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ENGINEERING INVENTIONS.

A steam valve has been patented by Mr. Arie Vögel, of Lake, Ill. It is a rotary reciprocating valve, formed with beveled bearing surfaces, with a hollow pivot formed with correspondingly beveled surfaces and a threaded end, with other novel features, that the steam may be alternately fed in before and behind the piston, so that the latter will receive its full force in each direction of the stroke.

AGRICULTURAL INVENTIONS.

A cultivator has been patented by Mr. Henry C. Leydorf, of Haskins, Ohio. This invention covers a novel construction and combination of parts for cultivators that can be readily adjusted in width, and so the shovels can be easily regulated as to height and inclined to one or the other side.

A self-raking attachment for reapers and harvesters has been patented by Mr. Martin Dew, of Cass City, Mich. It has a slotted platform and an arrangement whereby an endless chain driven by the driving mechanism of the mower or reaper operates rake teeth on sliding bars, whereby the rake teeth are projected and withdrawn at the proper times.

A grain drill has been patented by Mr. Mileden Wonser, of Kingston, Kansas. It has a series of rotary cutters mounted on a shaft having a series of inclined sections, and pivoted to bars sliding in grooves in stationary bars, so arranged that the inclination of the cutters can be readily adjusted, and they can be easily raised and lowered to deposit the grain at any desired depth in the ground.

MISCELLANEOUS INVENTIONS.

A clothes drier has been patented by Mr. Persse Deverell, of Rouseville, Pa. It is for drying clothes within the house, and its construction is such that it will automatically elevate the clothes to a position near the ceiling of the room, but the device is so arranged as not to take up floor space.

A saw tooth has been patented by Mr. William B. Risdon, of Trenton, N. J. This invention covers a novel construction and combination of parts in the saw plate, the bit, etc., whereby the teeth can be readily inserted and removed without detaching the saw from its mandrel, and without removing the holding spring from its seat.

A reclining chair has been patented by Mr. Lewis Davis, of Jackson, O. Combined with a supporting frame, with seat on a shaft, is a back rest and a leg rest hinged to the seat, braces connecting the back rest with a shaft actuating the shaft carrying the seat, with other novel features, whereby the chair can be easily adjusted to the desired position.

An inside shutter has been patented by Mr. Robert Blair, of New York city. Three blind sections are so arranged, with pulleys, cords, and weights, in connection with the window frame, by a novel combination of parts and details, as to facilitate the working of the shutters and have them entirely out of the way when not in use.

A shirt has been patented by Mr. Ernest A. Krones, of New York city. This invention consists of a re-enforcing strip extending down along the sleeve from the shoulder seam to the wristband, and formed at its lower end with a placket facing for the slit at the lower end of the sleeve, and with a tab on the upper end of the placket facing, for strengthening sleeves.

A machine for pearling wheat and other grain has been patented by Mr. John J. Hubbell, of Benzonia, Mich. It has a revolving shaft carrying numerous disks of stone combined with a hollow drum or cylinder, and the feed is regulated by devices of a novel character, for the removal of the outer skin or bran from wheat and other grain, leaving the berries whole.

A vehicle brake has been patented by Mr. William J. Devers, of Providence, Lackawanna Co., Pa. This invention uses a spring connected with a pulling attachment applied to the brake, a crank shaft being arranged transversely to the vehicle for operating the brake, the brake connections with the spring and crank shaft embodying several novel features.

A quilting machine has been patented by Mr. Martin H. Marcus, of Baltimore, Md. It has a supporting frame, a laterally movable intermediate frame with a quilt carriage movable longitudinally thereon, with mechanism for moving the frame and the carriage, the machine forming the pattern clearly and accurately, and being simple in construction.

A water elevator has been patented by Mr. Johnson C. Davis, of Athens, Ga. This is an improvement in that class of water elevators employing a pivoted water spout and trip devices connected therewith, arranged to be engaged and actuated by the water bucket, the invention relating especially to peculiar features of the trip mechanism.

A drain pipe connection for wash bowls, water closets, etc., has been patented by Mr. William D. Schuyler, of New York city. It consists of certain attachments, with novel construction of parts, intended to prevent the escape of sewer gases or offensive odors into apartments, and to facilitate the detection of leaks in the drain pipe or its connections.

A tobacco drier has been patented by Mr. Arthur F. Forbis, of McLeansville, N. C. The invention consists of certain heating and ventilating appliances for the fitting up of a barn for drying tobacco, to regulate the admission of air and temper it to the desired degree, as well as discharge the air at a suitable point, regulating the heat and saving fuel.

A nut lock has been patented by Mr. Aaron C. Vaughan, of Shane's Crossing, Ohio. It is an elastic jam nut consisting of a continuous elastic band or ring of metal, having an elongated opening and a tapered screw thread cut in its proximate inner sides, making an inexpensive lock for preventing a nut from turning off of the threaded end of its bolt.

A pianissimo stop for piano fortes has been patented by Mr. Vital Bèssier, of New York city. This invention consists in a piano with a damper rail between the sounding board and the strings, in addition to the usual damper devices, whereby the tones can be subdued as much as desired, or rendered inaudible altogether.

A lawn tennis net support has been patented by Mr. James H. Lee, of Canandaigua, N. Y. It consists of a pole for the attachment of the net cords, a ground socket to receive the pole, and retaining devices on the pole and socket to prevent the turning of the pole in the socket when the pole is in position to support the net.

A portable folding hammock stand has been patented by Messrs. Charles L. Rudd and Eben J. Manning, of Lake City, Minn. This invention covers an improved arrangement of the guy and supporting cords and in a novel canopy-suspending frame, as compared with that described in a former patented invention of the same inventors.

A folding bed has been patented by Mr. Karmell Brooks, of New York city. Combined with the folding and the stationary parts of the bed is a spring and its adjustable pivot arm and slotted bracket, the spring being so arranged that its tension can be readily regulated as the weight of the folding part of the bed may require.

A permutation padlock has been patented by Mr. William B. Turman, of Waldron, Ark. It is for use either as a padlock or doorlock, and is so made as to be opened when its parts are in certain relative positions, which may be changed at will, but it cannot be opened unless the parts are in the particular positions predetermined upon.

A washboard holder has been patented by Mr. Benjamin N. Merrill, of Lisbon, Me. It consists in a bar for attachment to the sides of the board, on each of the bars a swinging arm piece being held, having a ball head on its outer end, to rest against the inner sides of the tub and prevent the washboard sliding or slipping upward.

A satchel holder has been patented by Margret Smith, of Baltimore, Md. It consists of a metal plate with its upper end turned down and provided with a catch, the lower end turned up, crimped, and having a slot through which the down-turned catch is hooked, permitting satchels to be thereby readily affixed to and supported from garments.

A check hook has been patented by Mr. Joseph Darling, of Karns City, Pa. The back pad has a locking pawl and means for operating it, in combination with a notched check hook adapted to slide in a slot in the pad, with other novel features, the invention being an improvement on a former patented invention of the same inventor.

A device for converting motion has been patented by Mr. Jarvis M. Flint, of Thayer, Kan. Combined with a ring and turntable is a pivoted lever operated by the turntable and connected with a pump rod, for converting rotary into reciprocating motion, the device being especially applicable in working a windmill patented by the same inventor.

A privy has been patented by Mr. Edmund R. Angell, of Derby, N. H. It has a removable closed vault with a detachable pipe leading from the vault to earth, so arranged that an excess of gases will be conducted to earth, and prevent the poisoning of the atmosphere, the fittings being such as are not liable to get out of order.

A bottle stopper has been patented by Mr. Frank C. White, of Woodbury, N. J. The bottle has lugs on the opposite sides of its neck, and there is a ring surrounding the neck with spiral cams and offsets, arranged to engage projecting lugs, a bail carrying an elastic stopper, with its ends received in opposite sides of the ring.

A machine for stamping cigars has been patented by Mr. Leopold Grathwol, of Troy, N. Y. Combined with a vessel holding hot water, with pockets for type, are plates and springs for pressing the plates toward the types, the types being heated by the hot water surrounding the pockets, and names, trade marks, numbers, etc., therewith recessed or sunken in the faces of the cigars.

A honey box case and clamp has been patented by Mr. Oliver S. Foster, of Mount Vernon, O. Its construction is such that several tiers of honey boxes can be used without leaving spaces between them, and the tiers readily changed, or a tier nearly filled easily reversed, so the bees will fill all parts of the comb, and the boxes will not be discolored or disfigured with wax.

A wheel hub has been patented by Messrs. Stephen H. French and William J. Maltby, of Baird, Texas. This invention relates to wheel hubs which are made in several parts that they may be cast in metal, and provides a construction to adapt the mortise piece of the hub to be cast independently of the flanges, to form a positive clamp for the shoulders and protect the bearing from sand.

A tree feller and pile cutter has been patented by Mr. William G. Rendall, of Portland, Ore. It consists of a rotatable cutter mounted at the extremities of a series of arms pivoted to each other and to a frame mounted on a truck, the power to be applied by pulleys and belts from an engine on the truck, and a frame being fixed to the tree or pile to be cut for guiding the cutter.

The manufacture of spoons forms the subject of a patent which has been issued to Mr. William A. Warner, of Syracuse, N. Y. This invention covers the making of such articles in plated ware by inserting in the blanks, at points where the most wear will come on the finished article, a filling of precious metal or alloy, so that after the whole is plated the wear of these points will not expose the baser metal or alloy of which the article is mainly composed.

A revolving fan has been patented by Mr. Henry Menke, Jr., of De Witt, Neb. This invention covers a novel construction and combination of parts in the driving gearing or springs and cog wheels, pinions, etc., to make an effective device for driving away insects, and for briskly circulating air for cooling persons near the machine.

An automatic fan has been patented by Mr. James McK. Johns, of Glenmore, Ga. It has clock work which oscillates a pendulum, to which is adjustably fixed a central fan, side fans being hung by arms pivoted to the pendulum and connected with the central fan by brace links, the apparatus being so contrived that it can be run to fan the air fast or slow, as desired, by power obtained from a spring or weight, and so the fan can be conveniently located high up or low down in a room.

A gate has been patented by Mr. Theodore L. Patrick, of Paw Paw, Ill. It is made to slide back and forth between parallel posts, supported by a roller pivoted between the posts, upon which rests a horizontal bar of the gate, while rearwardly projecting horizontal bars slide between posts set at a suitable distance from the side of the roadway, and carrying upper and lower sets of rollers, so the gate is prevented from sagging in whatever position it may be in.

An automatic gate has been patented by Mr. John Clark, of Greenville, Cal. It has a swing post, with axial support at its upper end from the hinge post, and at its lower end in one of a system of levers pivoted in the gate sills, the swing post having an inclined groove, a platform adapted to be depressed resting on the levers, with other novel features, whereby the gate may be lifted and opened by depressing the platform, and will swing shut by gravity.

A combined button hook and coat and hat hanger has been patented by Mr. Louis B. Prahar, of Brooklyn, N. Y. Combined with the shank of a button hook having a slot and recess is an arm pivoted in the slot with a prong upon its pivoted end, the invention being an improvement on a former patented invention, to make such articles neater in appearance, less expensive, and more reliable.

A fastening for hand bag, pocket book, and purse frames forms the subject of two patents issued to Mr. Louis B. Prahar, of New York city. The two main parts of the frame are hinged to each other at their ends in the ordinary manner, but the construction is such that they will securely fasten themselves when the frames are closed, and can be readily opened, while they are reliable in use, neat in appearance, and inexpensive to manufacture.

A fastening for hand bag, pocket book, and purse frames has been patented by Mr. Gustave Hood, of Newark, N. J. Both sections of the frame have recessed parts, a plate with a flange and shoulder being hinged to one section, to engage with the recessed part of the other section, so that the frames will be fastened automatically when closed, and can be readily unfastened.

A shirt has been patented by Mr. Moriz Blau, of New York city. Its body and the main part are made in the usual way, but the sleeves have placket facings with narrow extensions, reaching up and stitched at intervals to the body of the sleeve, and formed with button holes, in connection with a re-enforcing piece extending from the shoulder, whereby the sleeves may be conveniently shortened.

NEW BOOKS AND PUBLICATIONS.

THREE YEARS OF ARCTIC SERVICE. The Expedition of 1881–84, and the Attainment of the Farthest North. By Adolphus W. Greely. Two vols., pp. 428,444. New York: Charles Scribner's Sons.

In one highly important particular these two sumptuous volumes on Arctic discovery far surpass in interest and value any former publications in the same department. The Greely expedition had the advantage of having been accompanied by a professional photographer, Mr. George W. Rice; and, besides the numerous official maps and charts, this work is profusely illustrated from excellent photographs, which give a realizing sense of the bleak and forbidding surroundings of the desolate regions visited that mere word painting could never produce. Of the most important work done by the expedition, the "attainment of the farthest north," the mapping of the northern shores of Greenland and Grinnell Land, and of Smith's Sound, Kennedy Channel, and Robeson Channel, with the average temperature and the currents in both water and air in these high latitudes, the public has already been made familiar by the accounts hitherto published, but there are many details here given which have never before appeared in print. These details are mainly based on the diary of Lieut. Greely, and give a succinct account of the daily experience of the explorers, the making and arrangement of their permanent quarters at Fort Conger, and how they passed the time there, their expeditions, by boat and overland, the difficulties met with and how they were overcome, and the part taken therein by each participant in their hard struggles—but all told in a simple and natural way that more effectively brings out the hard facts than could be done by any coloring in the narration, which is everywhere avoided. The tale is a plain one, but it is of thrilling interest throughout, and full credit is given to the work done by every member of the party, Lieut. Greely leaving his own part to speak for itself only as the simple statements of the facts bear their witness. It is pitiful to note, at the conclusion of this narrative of an amount of suffering and endurance never exceeded and but rarely endured by human beings, that the author feels called upon to call attention to the absence of any proper recognition by the Government of the services of those who served under him—that Sergt. Brainard, after eight years of stainless and such extraordinary service, still remains a sergeant in the ranks; that even the meager allowances originally promised for Arctic services have not been fully paid, and that one most self-sacrificing and soldierly man is being kept by private charity in a city hospital, his pension not even awarded.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

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Machinery for Light Manufacturing on hand and built to order. E. E. Garvin & Co, 139 Center St., N. Y.

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If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

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Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Nystrom's Mechanics.—A pocket book of mechanics and engineering, containing a memorandum of facts and connection of practice and theory, by J. W. Nystrom, C.E., 18th edition, revised and greatly enlarged, *plates*, 12mo, roan tuck. Price, $3.50. For sale by Munn & Co., 361 Broadway, New York city.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

Hercules Lacing and Superior Leather Belting made by Page Belting Co., Concord, N. H. See adv. page 158.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

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Timber Gaining Machine. All kinds Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Curtis Pressure Regulator and Steam Trap. See p. 142.

Bradley's improved Cushioned Helve Hammer. New design. Sizes, 25 to 500 lb. Bradley & Co., Syracuse, N. Y.

Cyclone Steam Flue Cleaners are the best. Crescent Mfg. Co., Cleveland, O.

Curtis Damper Regulator for draught and steam pressure in boilers. Curtis Regulator Works, Boston, Mass.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines. D. Frisbie & Co., Philadelphia, Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 158.

"Wrinkles in Electric Lighting," by V. Stephen; with illustrations. Price, $1.00. E. & F. N. Spon, New York.

Iron and Steel Wire, Wire Rope, Wire Rope Tramways. Trenton Iron Company, Trenton, N. J.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) If X and S., "readers for many years," will send their address, we will mail them an answer. Their question is not of sufficient general interest to take up room with here. Inquirers should read the notice at heading of this department.

(2) W. A. C. writes: In scaling saw logs by Doyle and Scribner's rule, should we allow half inches in measuring or should inches be counted, and not fractions of an inch? A. Use inches only in the register; when measuring, take the nearest whole number.

(3) W. K.—Your 1 pound of mercury will occupy a length of 2·564 inches in a 1 inch tube, and will expand, from zero to 90°, $\frac{1823}{100000}$ of an inch, or decimally 0·01923 inch.

(4) G. E. A. writes: I have made soldering iron of copper, which I cast in a mould. Now, when I want to hammer the copper into a point, it breaks off, whether cold or hot. 1. Can you tell me a remedy for it, so I can hammer it? A. Good copper can be hammered at a red heat; probably you have not pure copper. Better cast the point on. 2. What is an electrode? A. Electrodes are the poles of the electric circuit.

(5) H. W. S.—There are records of rainfall in the United States in a few places for 50 or 60 years past. The early records are not strictly reliable. The whole record shows variations of rainfall through decades of years, but not equalized, nor corresponding with any astronomical cycles. The reliable time of observation has not yet disclosed a secular decrease of rain for the United States, although in special localities such may be apparent.

(6) P. D. P. writes: Our boiler feed pipe and heater pipes are partly filled with hard lime scale, and will not work. How can we clean them? Have tried burning, but could not loosen scale. We keep boiler clean by using zinc scraps. A. We know of nothing cheaper than to renew the pipe if required at once. Filling the pipe with a solution of hydrochloric acid 1 part to water 6 parts will soon dissolve the lime, when it can be washed out. Not knowing what your incrustation is, whether carbonate of lime, sulphate of lime, or their mixtures with alumina from your clay beds, we are at a loss to say exactly what you require, but would recommend you to try to purify the feed water by filtration, by acid and soda treatment in a large tank, and settling, or heating the water in the tank by a coil, using the exhaust steam, or otherwise changing your boiler cleaning method from zinc scrap in the boiler to caustic soda in the feed water, about a quarter of a pound to a hogshead of water twice a week, and clean out boiler thoroughly of sediment once a month, or oftener if required.

(7) S. H. R. asks (1) if there are any acids or any compounds with acids that he can use to cut or eat through plate iron an eighth of an inch thick. If so, how to use same and with what results, the time it takes, etc.? A. Use nitro-hydrochloric acid equal parts, with fresh renewals every half hour. You may get through an eighth inch of iron in 5 or 6 hours. 2. The best book for information on the production and working of iron and metals. A. We recommend as the best book Osborn's Metallurgy of Iron and Steel (American practice), with large plates and illustrations, 8vo, $25. A cheaper work by "Greenwood," on the practice and theory of manufacture of iron and steel, $2. A general work comprising the manufacture and working in metals and alloys, by Byrne, "The Practical Metal Worker's Assistant," $7. All or any of which we can furnish.

(8) G. S. writes: Is there a formula by which to determine the temperature of water in a boiler generating steam under any pressure, say from 1 to 200 pounds per square inch? A. The formulas for determining temperature and pressure of water and steam as in a boiler under pressure are derived from the experiments of Regnault and others, and are tabulated in engineering works. For full explanations and tables see Haswell's Engineer's Pocket Book, $4.50, which we can furnish.

(9) B. M. G. and others.—A full illustrated description of the cable grip in use on the New York and Brooklyn Bridge, and the mechanism for operating it, was printed in the SCIENTIFIC AMERICAN of October 13, 1883.

(10) L. S. asks how modeling wax is made, such as sculptors sometimes use for modeling very small figures, etc. It is made of white wax melted and mixed with lard to make it workable. In working it, the tools used, the board or stone, are moistened with water, to prevent its adhering; it may be colored to any desirable tint with a dry color.

(11) W. W. asks how to varnish chromos. A. Take equal quantities of linseed oil and oil of turpentine, thicken by exposure to the sun and air until it becomes resinous and half evaporated, then add a portion of melted beeswax. Varnishing pictures should always be performed in fair weather, and out of any current of cold or damp air.

(12) C. B. asks what will take machine oil spots out of plain colored wall paper. A. Oil stains may be removed from paper by applying pipe clay powdered and mixed with water to the thickness of cream; leave on for four hours.

(13) E. G. P. asks what is used to kill the odor of benzine. A. Shake repeatedly with plumbate of soda, made by dissolving oxide of lead in caustic soda, and rectify. Simply shaking with charcoal and filtering will partially remove the odor.

(14) J. S. asks about the preparation of quicksilver for making mirrors, and the mode of applying same to the glass. A. The essential features of the process are the coating of the glass with tin foil, and then pouring quicksilver or mercury on the tin, thereby forming an amalgam which adheres to the glass. The exact method is given in Spons' Workshop Receipts, 1st series, which we can send for $2.00. The remuneration for such work is not high, and the wages are similar to those received by an ordinary mechanic.

(15) W. H. B. asks: 1. How much less is obtained by assaying copper by the dry method than by the wet? A. The fire assay of copper is by no means accurate, while the wet method of separation by the battery is very exact. 2. What is the difference between control assays and that of ordinary assays? A. Control assays are methods used to corroborate results obtained by other processes.

(16) A. P. S. asks for (1) a good solvent for nicotine. A. Nicotine is soluble in water, alcohol, and ether. 2. Several common roots, like the carrot, that will sprout or blossom when hollowed, hung up indoors, and filled with water. A. The sweet potato is said to be very beautiful when used as described by you. Wet sponges filled with seed are likewise commonly seen.

(17) W. J. H. writes: 1. A clock has twelve hands, and at twelve o'clock are all started together from the same point. The first hand makes a tour of the dial in one hour, the next in two hours, next in three hours, etc.; how long will it take all the hands to meet at their starting point? A. 27,720 hours, that number being the least common multiple of all the terms from 1 to 12. The 12 hour revolution hand goes around 2,310 times; the 11 hour hand, 2,520 times; the 9 hour hand, 3,080 times, etc. 2. I desire a recipe for making an indelible ink that I can use with an ordinary rubber stamp. A. See the recipe given for an indelible stamping ink, published on page 19 of SCIENTIFIC AMERICAN for July 11, 1885.

(18) J. N. writes: During an argument to-day, one of the parties asserted that a ton of wood and a ton of iron placed in a vacuum, the wood would weigh more than the iron. State if such is the case, and if so, why so? A. The wood would be the heavier on account of its larger volume of air. Its bulk would represent a cubic foot of air at 60° Fah., weighing 536·96 grains.

(19) C. I. asks (1) what kind of wood is best for ebonizing. A. Cherry is most used, but apple, pear, and hazel woods are also suitable. 2. Please give best receipt for ebonizing. A. See answer to query 11, given in SCIENTIFIC AMERICAN for July 11, 1885. Spons' Workshop Receipts, 2d series, devotes several pages to the subject. We can send it for $2.

(20) C. E. T. asks about a cemented cistern, the water from which tastes badly, probably the cement has an excess of magnesia. A thick wash of pure Portland cement will probably correct the strong taste. If not, a coat of paraffine put on the surface and melted in with hot iron will make the cistern odorless.

(21) F. F. Z.—The holes in material on which porous plasters are made are punched in a machine that makes a whole row at once, moving the cloth along by a ratchet. The machines are not on sale. Tracing cloth is thin muslin sized with isinglass and passed through polished rolls heated by steam. Tracing paper is either sized with isinglass and calendered, or oiled with linseed oil. Silver ink is composed of 1 part white gum arabic, 4 parts distilled water, 1 part silicate of soda in solution. Triturate with the best silver bronze powder sufficient to give the solution the required brilliancy. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 157, for gold and silver inks. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 249, how to make luminous paint.

(22) M. A. P.—See list of ink erasing materials given in the article on "Inks," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157.

(23) J. M. F.—Experts examine the inks of writings by comparative means. See "Detection of Inks," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 255. The condition of the paper under the microscope and different qualities of ink on the paper are noted, but the age is difficult to determine. Old ink is not as easily removed from the paper as that more recently written with.

(24) J. E. M. asks about producing sulphate of zinc. A. The most convenient method is by dissolving metallic zinc in sulphuric acid (dilute). It can be commercially produced by roasting the mineral sulphide in the air.

(25) N. C. R.—The wood mouldings for picture frames are cut in a machine, brushed over with the plaster of Paris, and smoothed down with a steel trowel of the same form as the moulding. The plaster has a little glue mixed with it. For your blackboard to use with chalk use shellac varnish, lampblack, and powdered pumice; mix as a paint and brush over quickly. For your artificial slate, use shellac varnish, lampblack, and finest flour of emery. Thin the shellac varnish with 95 per cent alcohol, so that the emery will have a cutting surface. The exact proportions you must find by trial.

(26) J. B. writes: I would like to know the composition of red and white liquids in the little tubes in storm glasses. A. 1. The red consists of alcohol slightly colored with a little aniline or logwood. 2. The white is composed of:

Camphor	2½ drachms.
Alcohol	11 "
Water	9 "
Saltpeter	38 "
Sal ammoniac	38 "

Dissolve the camphor in the alcohol and the salts in the water, and mix the solutions together.

(27) C. writes: I have a plaster Venus de Milo, which has been painted white. I do not know if lead or zinc white. It has begun to peel, and looks as if it had had the small pox. How can I remove the paint that still sticks, preparatory to repainting? A. Take a hot solution of washing soda in the proportion of 3 pounds of the soda to a gallon of water. This mixture will readily soften the paint, so that it can be removed by simply scrubbing with a stiff brush.

(28) C. K. asks how to remove candle grease from furniture without injuring the varnish. A. Rub it off with a little warm water and a rag.

(29) G. K. desires a receipt for making antique brass. A. Dissolve 1 ounce sal ammoniac, 3 ounces cream of tartar, and 6 ounces common salt in 1 pint hot water; then add 2 ounces nitrate of copper, dissolved in a half pint water; mix well, and apply it repeatedly to the article by means of a brush.

(30) C. W. F. asks: 1. What is the ore found between lumps of soft coal? A. Probably pyrite, or iron sulphide. 2. How near completion is the statue of Liberty? A. The pedestal, it is said, will be completed in May. It is uncertain when the statue will be in place.

(31) D. M. R. writes: I have a one-half horse power engine; how large a boat would it run with stern paddle wheel, said boat to be very light and of good model? A. A boat 25 to 30 feet long, depending upon the size of boiler, pressure, and speed of engine. With all these large, a 35 foot boat will be appropriate.

(32) L. D. H.—As air weighs 0·076 pound per cubic foot, your cylinder of 10 cubic feet and 100 pounds weight would weigh 99·24 pounds without air inside.

(33) H. H. L. writes: We have an 80 horse power automatic cut-off engine, which only has load enough to require 40 pounds steam. Is it more economical to run with 80 pounds and large expansion or 40 pounds with small expansion? A. Run with high pressure and cut-off for required power for economy.

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March 9, 1886,

AND EACH BEARING THAT DATE.

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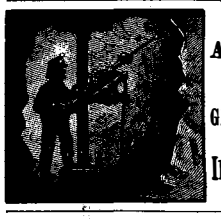

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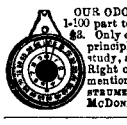

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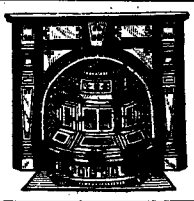

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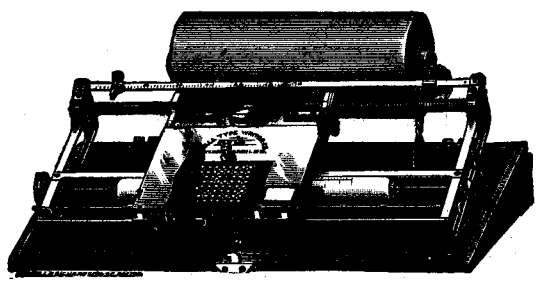

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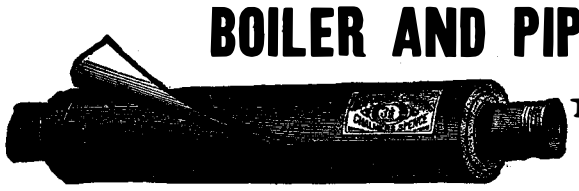

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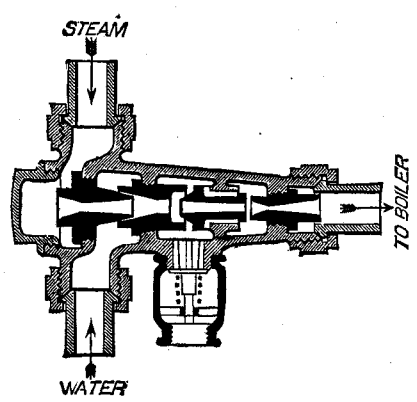

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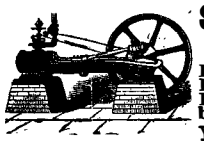

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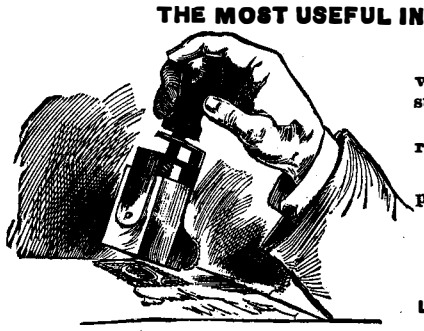

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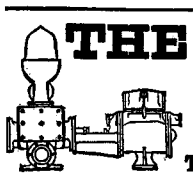

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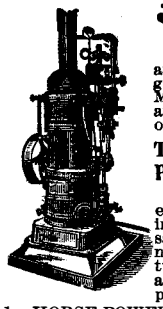

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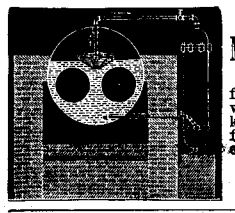

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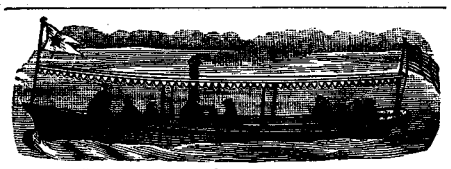

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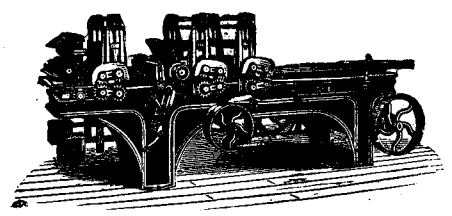

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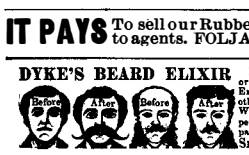

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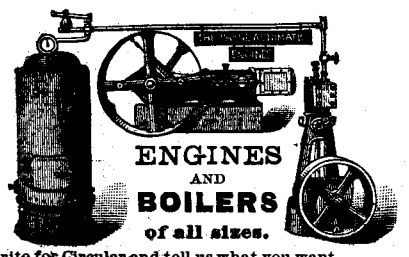

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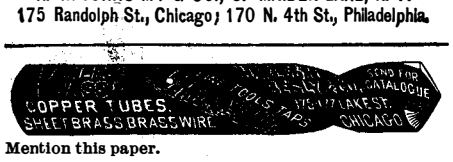

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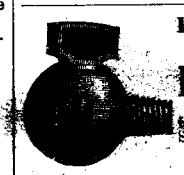

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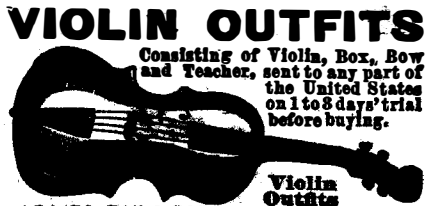

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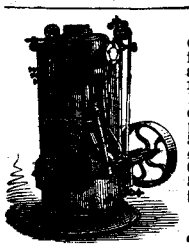

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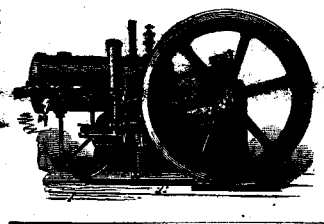

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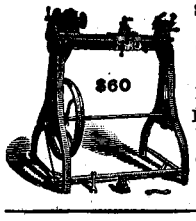

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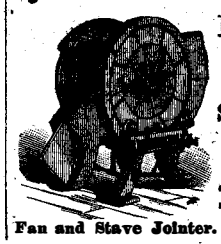

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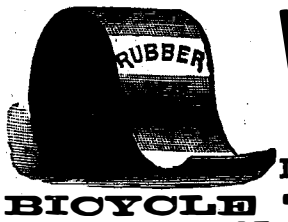

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